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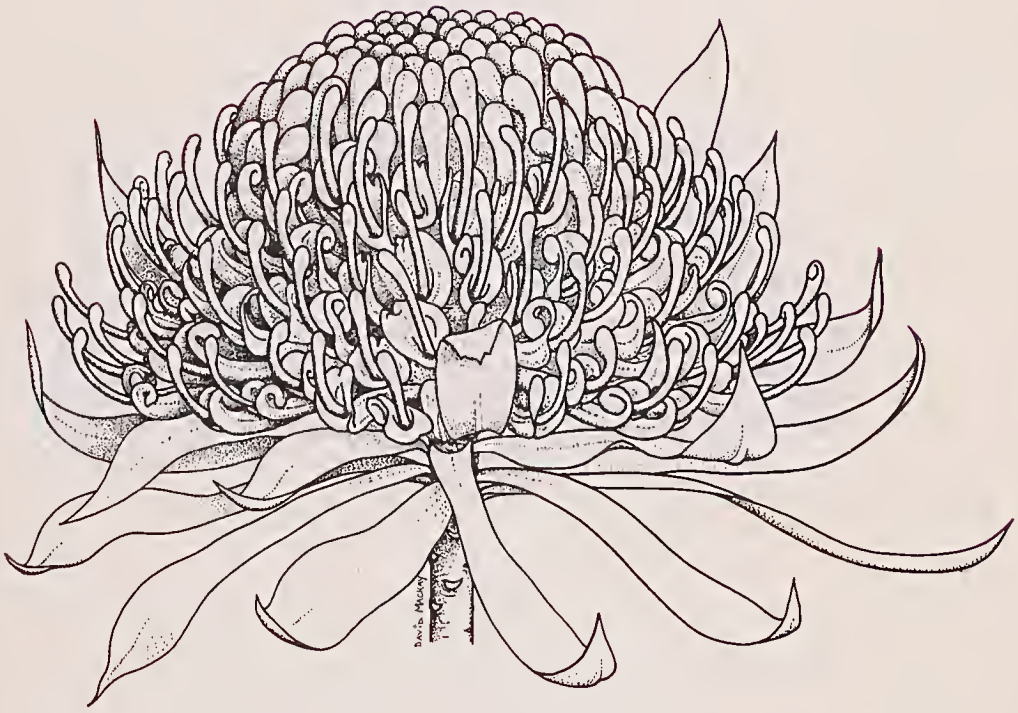

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A revision of the genus *Xanthostemon* (Myrtaceae) in Australia

Peter G. Wilson

Abstract

Wilson, Peter G. (National Herbarium of N.S.W., Royal Botanic Gardens, Sydney 2000) 1990. A review of the genus Xanthostemon *(Myrtaceae) in Australia.* Telopea *3(4): 451–476.* — The Australian species of *Xanthostemon* are examined in the light of morphological and anatomical evidence and their relationships are discussed. Thirteen species are recognised, three of them new: *X. formosus*, *X. xerophilus* and *X. graniticus*. Also, the new combinations *X. petiolatus* (based on *Nania petiolata* Valeton) and *X. verus* (based on *Metrosideros vera* Roxb.) are made for two Malesian species.

Introduction

Xanthostemon is a genus of at least 45 species, most of which are arborescent, with a range extending from the Philippines to the Solomon Islands, New Caledonia and Australia. In Australia, the distribution is predominantly tropical with the only extratropical species, *X. oppositifolius*, occurring not far north of Brisbane.

When Ferdinand Mueller described the genus in 1857 with one species, *X. paradoxus*, he stated that it was close to the genus *Metrosideros* but was presumably convinced of the distinctness of the taxon by its golden-yellow stamens and its almost superior capsule. In the first volume of his 'Fragmenta' (1858: 80) he added a new species, *X. eucalyptoides*, and particularly indicated three character-states that distinguished *Xanthostemon* from *Metrosideros*, viz., capsule hardly adnate to the calyx tube, endocarp becoming free, and seeds flattened. However, in a later part of the same publication (1858: 243) he reduced the genus to subgeneric status under *Metrosideros*, influenced by the affinity of his two species to *Metrosideros ciliata* (now usually considered to constitute the monotypic genus *Purpureostemon* Gugerli).

Bentham (1865, 1867) reinstated the genus *Xanthostemon* for species with alternate leaves, e.g. *X. paradoxus*, but left species with opposite leaves, e.g. *X. eucalyptoides*, in *Metrosideros*. Gugerli (1940), in his monograph of the genus *Xanthostemon*, follows Bentham in excluding those species with strictly opposite leaves, except for *X. oppositifolius* which F.M. Bailey had placed in *Xanthostemon* rather than *Metrosideros* because the fruits were quite similar to those of *X. chrysanthus*. In this case, Gugerli's reasoning was based on his interpretation of leaf arrangement which he described as 'folia subopposita vel leviter alterna'. Although he excluded them from his taxonomic treatment, Gugerli did give some consideration to the opposite-leaved species which he considered under *Metrosideros* sect. *Nania*, and concluded that the latter taxon could be combined with ('zurückgeführt') *Xanthostemon*. While his monograph was in preparation, Gugerli (1939) described a new genus, *Purpureostemon*, distinct from *Xanthostemon* in four characters, viz., quincuncial (vs. imbricate) aestivation of the corolla, extent of fruit dehiscence, reduced size of the embryo (associated with the winged seed) and placenta angle (oblique rather than horizontal).

Mcrrill (1952: 156), in a discussion of *X. crenulatus* C. White, a species with opposite leaves, considered that it might be better placed in the genus *Nani* Adanson (*Nania* Miq.) which had long been considered a synonym of *Metrosideros* but which Valeton (1901: 65) accepted (as *Nania*) as generically distinct from *Metrosideros* on the basis of the more or less superior fruits and the different seeds and placenta. However, although Mcrrill seemed to be in favour of placing opposite-leaved species in *Nani* he did not transfer *X. crenulatus* to that genus.

Dawson (1972a) compares the four genera *Xanthostemon*, *Nani*, *Pleurocalyptus* and *Purpureostemon*, and concludes that none of them have any close affinity with *Metrosideros*. The four genera have a large number of character-states in common and differ from each other in only a few respects, and so Dawson raises the possibility that a detailed revision would lead to these genera being merged. Briggs and Johnson (1979) present an informal classification of the genera of the Myrtaceae into alliances, suballiances and infra-alliances and within this scheme they place the genera *Xanthostemon* (including *Nani*), *Purpureostemon* and *Pleurocalyptus* in the *Xanthostemon* suballiance, which is part of the *Metrosideros* alliance. If all four genera are combined, or if *Nani* alone is merged into *Xanthostemon*, the name *Nani* Adanson has priority but Wilson and Dawson (1981) have proposed that *Xanthostemon* be conserved against it.

Discussion of Characters

Phyllotaxis

In the Myrtaceae, the phyllotaxis is generally opposite and decussate or alternate, i.e. disperse in the terminology of Briggs and Johnson (1979), in both juvenile and mature plants. The best known exception to this is the condition found in most species of *Eucalyptus* sens. lat., where the juvenile foliage is opposite and decussate with the adult foliage becoming alternate by the separation of the pairs of leaves through expansion of the intranode, i.e. disjunct opposite in the terminology of Briggs and Johnson (1979). Another example is the genus *Lophostemon* which also has opposite leaves in the juvenile stage and alternate (disjunct opposite) leaves in the adult; the latter is most noticeable in young plants when the phyllotaxis first changes, but it is obscured in the more mature plant by the aggregation of almost all the true leaves into a pseudoverticil at the tip of the seasonal growth unit (Wilson & Waterhouse 1982). In *Lindsayomyrtus* it has been reported (Hyland & van Steenis 1973) that the first leaves in the seedling are opposite but that the phyllotaxis very soon becomes disperse, and a similar occurrence has been observed in *Welchiodendron* seedlings (Wilson & Waterhouse 1982). This ontogenetic sequence also occurs in at least some *Melaleuca* species and in *Leptospermum* (J. Thompson, pers. comm.) and may be more widespread in the family than the literature would indicate.

In *Xanthostemon*, however, a further exception is found in three of the species with opposite adult leaves, viz., *X. eucalyptoides*, *X. umbrosus* and *X. xerophilus*. When seed of these species was germinated, the seedlings were found to bear alternate leaves for at least the first season's growth. However, the phyllotaxis was not identical; in *X. xerophilus* it was distinctly disperse but in *X. eucalyptoides* it appeared to be disjunct opposite. Disperse phyllotaxis

succeeded by opposite has recently been reported for the newly described genus *Barongia* (Wilson & Hyland 1988) which does not, however, appear to have close affinities with *Xanthostemon.*

A variation of this has been observed in *X. whitei*; this species has predominantly disperse leaves but produces occasional branchlets bearing opposite leaves. Another species, *X. verticillatus,* has its leaves in apparent whorls of (3–)4(–5) at each node, a unique phenomenon in the genus. In the related genus *Purpureostemon,* which has alternate (? disjunct opposite) leaves, it has been observed (J.W. Dawson, pers. comm.) that the seedlings of the single species, *P. ciliatus,* bear opposite leaves.

Inflorescence

A range of inflorescence types is found in the genus. Briggs and Johnson (1979) record the occurrence of monads, triads, botryoids, metabotryoids and panicles; metaxymonads were said to occur rarely. All these inflorescence types have been observed in Australian species during the present study, as well as occasional metaxytriads. Briggs and Johnson also comment that branching in the larger unit inflorescences is often subopposite or irregular and that recaulescence (adnation of a bract ("pherophyll") to the axis it is subtending) is common. All inflorescences in *Xanthostemon* are axillary, although certain species have pseudoterminal inflorescences consisting of aggregations of lateral monads, triads or botryoids, subtended by reduced phyllomes, that occur at the apex of a stem.

Hypanthium and Perianth

The perianth in *Xanthostemon* is perigynous, the sepals and petals being borne on the rim of a dished hypanthium. The hypanthium varies in shape from broad and shallow to relatively deep and cylindrical. In the latter case, the rim of the hypanthium much exceeds the ovary summit while in the former it is below or barely exceeds the ovary summit. The variations in this character were used by Gugerli (1940) as the basis for a number of the sections that he described. In at least three species (two from Australia and one from the Philippines), the broad hypanthium has concave depressions opposite the petals; this feature was the basis of Gugerli's Section *Vesicaria.* Two of these species, *X. youngii* from Queensland and *X. speciosus* from the western Philippines (Calamian-Palawan group), have red flowers. This character may be associated with bird pollination; however, there are no published observations on the pollination biology of any member of the genus.

The petals are always free and may be red, yellow or cream to white in colour. There are at least four species with deep red petals and stamens but these do not seem to have arisen in the same evolutionary line as the red-flowered *Purpureostemon ciliatus,* and may not themselves represent a monophyletic group. A number of other species, from New Caledonia, have petals that are reddish orange to red but the filaments of the stamens are not necessarily the same colour.

The sepals are free and persistent; however, in the related New Caledonian endemic genus *Pleurocalyptus* the calyx is fused to form a calyptra which tears irregularly at anthesis to reveal the petals and stamens. The single species of

this genus has very close affinities with one particular group of New Caledonian species of *Xanthostemon* (Gugerli's Sect. *Bullata*) and does not warrant generic status solely on the basis of this one character-state (Wilson 1987).

Androecium

The stamens are numerous, mostly the same colour as the petals and arranged in one to several rows. They are relatively long (at least twice as long as the petals in most cases) and are usually the most prominent feature of the flower. Bentham (1867), in his description of the genus, says "stamens indefinite, free or slightly united at the base" but there is no evidence of regular fusion in any species that I have examined, although occasionally two filaments are connate giving the impression of a single stamen with two anthers. In some species there are small gaps in the ring of stamens opposite the centre of each sepal; in other cases the stamens are in two rows in front of a petal but in a single row elsewhere.

The exact nature of the androecium of *Xanthostemon* will only be determined through developmental studies. Payer (1857) was the first to investigate floral organogenesis in the Myrtaceae and described the development of the corolla primordia followed by the differentiation of each of these into a petal and a staminal primordium from which the individual stamens developed centripetally; his work implied that the family is basically obhaplostemonous. However, Johnson and Briggs (1985: 739) argue that the family is basically obdiplostemonous and give a range of examples to support this view.

In the original description of the genus, Mueller stated that the anthers were basifixed. However, Gugerli (1940:33) and Dawson (1972a, fig. 8) have shown that the anthers are, in fact, dorsifixed; the point of attachment of the filament is under a flap of the connective so that it can give the superficial impression that the anthers are basifixed. This mode of attachment is distinctive and is consistently present in *Xanthostemon*, *Pleurocalyptus* and *Purpureostemon* (Dawson 1972a). There seems to be a similar structure occurring in some species of *Metrosideros* sens. lat. (see, e.g., Dawson 1972b).

Another distinctive feature of the anther in *Xanthostemon* is the nature of the oil glands in the connective. The Myrtaceous anther typically has a conspicuous oil gland towards the apex of the connective, but in *Xanthostemon* this single large gland is often accompanied by a number of smaller glands elsewhere in the connective. This was noted by Dawson (1972a) in all the genera of the *Xanthostemon* group and has been observed in the present study in at least six species, *X. paradoxus, X. chrysanthus, X. whitei, X. umbrosus, X. psidioides* and *X. graniticus*; the extra glands may be present in other Australian species but are sometimes difficult to detect. Some species of *Metrosideros* sens. lat. also have such additional glands in the connective (Dawson 1970a,b, 1972b).

Ovary and Fruit

The ovary in *Xanthostemon* is often almost superior, although the base is always broadly attached, and it is this character-state, coupled with the subsequent fruit development, that gives the genus its distinctive appearance. The sides of the ovary are free from the hypanthium rather than adhering to it as in most other Myrtaceous genera with the exception of *Ristantia* and, perhaps, a

few other genera. The style is terminal on the ovary or, more usually, set into a slight depression in the summit; the stigma is flat or convex and is as wide as or narrower than the style.

The placentas in most species are rod-like and project into the loculi from the axis at various angles. The only exception to this is in the two closely related species *X. crenulatus* and *X. eucalyptoides* where the ovules are attached to the axis above a very slight protrusion (Fig. 1a). The placentas in these two species have been erroneously thought to be erect and, therefore, the species have been assumed to be part of the same taxon as the type of the genus *Nani* Adanson (Dawson 1972a) which is not here considered to be sufficiently distinct from *Xanthostemon* to warrant separate generic status. The condition described for *Nani* by Dawson (1972a) of placentas obliquely inserted towards the base of the axis and more or less erect, is, however, present in the two Australian endemic species *X. psidioides* and *X. graniticus* (Fig. 1b). In *X. umbrosus* and at least one species from New Guinea the placentas arise from the axis and project obliquely into the upper part of the loculus (Fig. 1c), while in the bulk of the species in the genus the placentas project horizontally into the centre of the loculus (Fig. 1d). In *Purpureostemon* the placenta is oblique but arises from the base of the axis and projects into the centre of the loculus (see Gugerli 1939: Fig. 2).

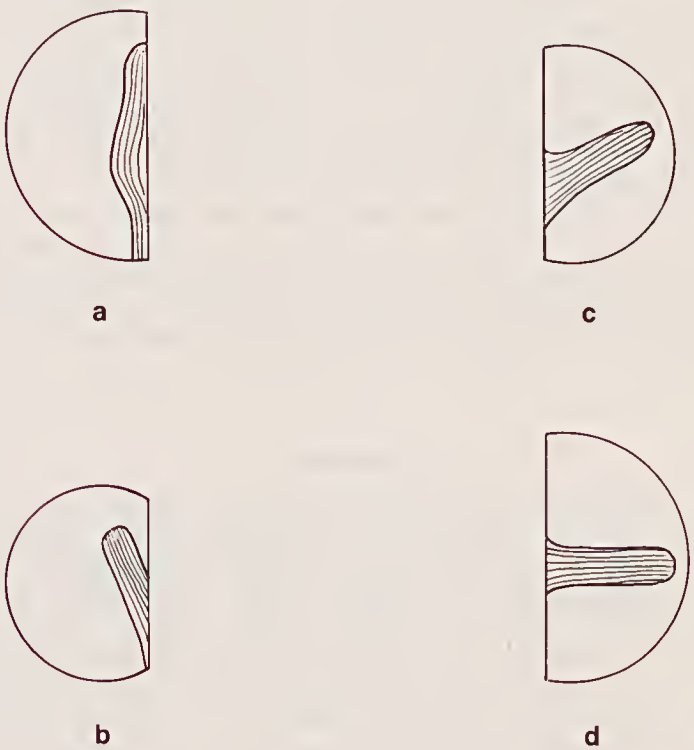

Fig. 1. Diagrammatic representation of the various placenta types found in *Xanthostemon* (see text for details).

The ovules are hemitropous (Dawson 1972a), bilaterally flattened and accumbent to the axis or the placenta. In the species with horizontal placentas the ovules form a complete ring around the placenta whereas in the species with oblique placentas the ring is almost complete, being interrupted at the top by the axis. In *X. crenulatus/eucalyptoides* and *X. psidioides/graniticus* the attachment of the ovules is such that they are borne in an arc. In *Purpureostemon* the different configuration of the placenta with respect to the loculus allows the placenta to bear a complete ring of ovules (Dawson 1972a).

As the ovary develops into the fruit, the free part expands at a much faster rate than the fruiting hypanthium so that, finally, the fruit is strongly exserted from the hypanthium. In a fruit that develops from a flower with a shallow hypanthium, the fruiting hypanthium does not enclose the base of the fruit while a cupular hypanthium will often partly enclose the base of the fruit.

Seed and Embryo

The fertile seeds of *Xanthostemon* species are bilaterally flattened and deltoid to semicircular in outline. The embryo usually fills the seed but in two species, *X. eucalyptoides* and *X. crenulatus*, the embryo is confined to one end of the seed, the other being a somewhat membranous wing. Dawson (1972a: Fig. 61) shows a winged seed in *Purpureostemon* but a closer examination of this wing reveals that it is not homologous with the wing in the two species of *Xanthostemon*; in *Purpureostemon* the major wing development is between the raphe and the embryo while in *X. eucalyptoides* and *X. crenulatus*, it is distal to the raphe. Winged seeds in *Xanthostemon* are more or less the same size as unwinged seeds but the embryo in the winged seeds is relatively small and consequently they weigh much less. For example, the average weight of the unwinged seed of *X. chrysanthus* is 3.2 mg while the average weight of the (fertile) winged seed of *X. eucalyptoides* is only 1.3 mg.

The embryo of members of the *Xanthostemon* suballiance is very distinctive. The cotyledons are relatively broad (when compared, for example, with *Metrosideros*) and flat and lie face-to-face; the hypocotyl is bent more or less at right angles to the cotyledons and is accumbent (i.e. lying along the margins of the cotyledons). No other genus of the Myrtaceae is known to have the same embryo type.

Palynology

The study by Pike (1956) of Myrtaceous pollen included three species of *Xanthostemon*, viz., *X. crenulatus*, *X. paradoxus* and *X. verdugonianus*, but apart from a general description of the grains in tabular form and a line drawing of a pollen grain of *X. crenulatus*, the only comment on the genus related to the occurrence of syncolpate or parasyncolpate grains. The more recent study by Gadek and Martin (1981) also included only three species, *X. crenulatus*, *X. chrysanthus* and *X. psidioides*, but the increased resolution of the S.E.M. has enabled a more precise description of the surface pattern of two of the grains as 'microfossulate'. These authors characterise the genus by this type of sculpture as well as by the presence of arcuate colpi and predominantly parasyncolpate grains. However, in a genus of over 40 species, this sample is far too small for any definite conclusions to be reached. The morphological diversity of the genus, and its wide geographic range, would make it a fruitful area

for a more detailed investigation. A recent survey of Myrtalean pollen (Patel et al. 1985) did not include any species of *Xanthostemon.*

Vegetative Anatomy

Earlier studies of anatomy have indicated some characters that may be useful in the taxonomy of *Xanthostemon* as well as in distinguishing that genus from other genera. The study by Ingle and Dadswell (1953) showed that it is not always possible to distinguish genera from each other on the basis of wood anatomy: from their key, *Xanthostemon* would appear to be indistinguishable from *Callistemon*, *Calothamnus*, *Lysicarpus*, *Melaleuca*, *Syncarpia*, and *Tristania* sens. lat. On the other hand, bark anatomy appears to be of considerably more value in characterising genera. Bamber (1962) found, from a survey of four species in the genus, that *Xanthostemon* is distinctive in having the following combination of character-states: alternating layers of sclerosed and suberized cells in the phellem, silica deposits in the ray parenchyma cells (except in the New Caledonian *X. aurantiacus*), fibre-sclereids, and oil glands usually present. On the basis of bark anatomy, Bamber was able to determine that a specimen sent to him labelled "*Metrosideros* sp." was probably a species of *Xanthostemon.* During the present study, observation has recorded oil glands in the bark of *X. eucalyptoides* and *X. graniticus.*

Gugerli (1940) studied vegetative anatomy in his monograph of the genus but this aspect of his work has rarely been referred to. For example, he had already noted (p. 27) that there were alternate rows of sclerosed and suberized tissue in the periderm and that sclereids were found almost always and oil glands less frequently. His findings on leaf anatomy are also quite important. He records the presence of a hypodermis in every one of the 38 species that he examined and this ranged from a single, discontinuous layer in the Australian species *X. oppositifolius* to a very substantial layer five cells deep, occupying almost half the leaf thickness, in the New Caledonian species *X. grandiflorus.*

In the present study, the leaf anatomy of 12 species (10 from Australia, 2 from New Guinea) was examined and a hypodermis was found to be always present; this varies from being a single, discontinuous layer to a layer three cells thick that takes up 5–18% of the leaf thickness. Another notable anatomical feature observed was the nature of the support tissue associated with the secondary leaf traces; in every species examined there is an adaxial column of sclerenchyma reaching through the palisade mesophyll up to or almost to the hypodermis while on the abaxial side there is usually a smaller group of sclerenchyma cells and, below that, a short column of lightly thickened collenchyma reaching to the lower epidermis. There appears to be a correlation between the degree of sclerophylly, as shown anatomically by the amount of sclerenchyma and the thickness of the hypodermis, and the usual habitat of the species; those from woodlands on poorer soils, e.g. *X. paradoxus* and *X. xerophilus*, are more sclerophyllous than those from moist riparian or rainforest situations, e.g. *X. chrysanthus* and *X. whitei.*

Gugerli (1940) reported the occurrence of sclereids or idioblasts in the midveins of many species but not in any of the four Australian species that he studied: in the present investigation only one species, the extra-Australian *X. novoguineensis*, displayed this character-state. Gugerli also noted various kinds of sclereids in the pith of young stems; in this study small groups of sclereids were found to be commonly present in the pith but large, angular sclereids were

observed only in the pith of *X. novoguineensis*. Gugerli did not remark on the presence of oil glands in the medulla of the petiole or in the pith; in this study oil glands were observed in the medulla of the petiole in seven species, and an examination of the stem revealed oil glands in the pith in each of these species and also in four other species that had not shown oil glands in their petioles. It seems likely that oil glands occur in all species but may be infrequent in some and thus overlooked.

Oil glands in the leaf lamina were in the size range 55–120 μm in diameter which is almost identical to that recorded by Gugerli for the four Australian species he examined, although the usual range for the extra-Australian species he studied was 100–220 μm. In only one species, *X. psidioides*, were the oil glands consistently located below the palisade in the leaf and this accounts for the difficulty in observing oil glands in fresh leaves of this species.

Discussion of relationships

The species of *Xanthostemon*, as accepted here, fall into a number of distinct groups. The first of these is the group containing *X. eucalyptoides* and *X. crenulatus*; Dawson (1972a) has suggested, following a number of earlier authors, that these two species are closely related to the type species of the genus *Nani* Adanson. These two species are each other's closest relatives as shown by their shared, unique derived character-states (synapomorphies), particularly the narrow perianth segments, the placentation and the winged seeds; there are no obvious synapomorphies linking them to *Nani*.

A second distinctive group of species is made up of *X. psidioides* and *X. graniticus*. The fruits of these two species are superficially similar to that illustrated by Dawson (1972a) for the type species of the genus *Nani*, but there are some differences between these species and *Nani*. In *Nani* the leaves are regularly opposite and mesophyllous while in *X. psidioides* and *X. graniticus* they are alternate and stiffly coriaceous. These differences in leaf arrangement are not necessarily significant since phyllotaxis seems to have become fixed as either opposite or alternate a number of times in the genus (Wilson, unpublished analysis).

A third group of species consists of *X. youngii* and *X. speciosus* Merr. from the Philippines which both have red flowers and vesiculate hypanthium; *X. formosus* shares the vesiculate hypanthium of these species but lacks the derived character-state 'red flowers' and differs markedly in leaf shape and texture, and fruit morphology.

Other species that appear to be closely related are 1) *X. oppositifolius*, *X. xerophilus* (and possibly *X. verticillatus*), and 2) *X. umbrosus* and *X. petiolatus*; these groups of species both have opposite leaves but are not closely related to each other as shown by the difference in placentation (see discussion above). The three remaining Australian species, *X. paradoxus*, *X. chrysanthus* and *X. whitei*, seem to form a group but this may only be due to the sharing of unspecialized (plesiomorphous) rather than specialised (apomorphous) character-states, and may not indicate common evolutionary descent; their affinities may lie with the *X. oppositifolius* group which shares the same placentation.

In this paper, *Xanthostemon* (including *Nani* Adanson) is treated as a single genus. A phylogenetic analysis of the genus and the genera *Purpureostemon* and

Pleurocalyptus (i.e. the *Xanthostemon* suballiance of Briggs and Johnson 1979) is in preparation (see Wilson 1987) and this will examine the evolutionary relationships between the species in these taxa.

In accordance with the conclusions reached so far, new combinations are made here for two Malesian species.

Xanthostemon petiolatus (*Valeton*) *Peter G. Wilson,* **comb. nov.**

BASIONYM: *Nania petiolata* Valeton, Meded. Lands Plantentuin 40: 172 (1900); Ic. Bogor. 1 (4): t. 99 (1901).

Xanthostemon verus (*Roxb.*) *Peter G. Wilson,* **comb. nov.**

BASIONYM: *Metrosideros vera* Roxb., Hort. Bengal.: 37 (1814); Fl. Ind. ed 2, 2: 477 (1832).

Xanthostemon

Xanthostemon *F. Muell.*, Hooker's J. Bot. Kew Gard. Misc. 9: 17 (1857) *nom. cons.*
TYPE: *Xanthostemon paradoxus* F. Muell.

Nani Adans., Fam. Pl. 2: 88, 581 (1763) *nom. rejic.*
TYPE: *Metrosideros vera* Roxb.

Nania Miq., Fl. Ind. Batav. 1: 399 (1855) *nom. illeg.*

Draparnandia Montr., Mem. Acad. Lyon 10: 205 (1860)
TYPE: *Draparnandia multiflora* Montr.

Metrosideros subg. *Xanthostemon* (F. Muell.) F. Muell., Fragm. 1: 243 (1859).

Metrosideros sect. *Nani* (Adans.) Niedenzu, Nat. Pflanzenfam. 3(7): 88 (1898), as 'Nania Miq.'

Nani sect. *Xanthostemon* (F.Muell.) O. Kuntze in Post & Kuntze, Lexicon Gen. Pl.: 382 (1904), as 'Nania'

Fremya Brongn. & Gris, Bull. Soc. Bot. France 10: 372 (1863); Ann. Sci. Nat. Bot., sér. 5, 2: 131 (1864).
TYPE: F. rubra Brongn. & Gris

DISTRIBUTION: Northern Australia, New Caledonia, New Guinea, Solomon Islands, eastern Indonesia, Philippines.

Low shrubs to tall trees, bud scales lacking. *Leaves* of all species alternate in the juvenile stages, some species becoming opposite. *Inflorescences* of axillary monads, triads, botryoids, metabotryoids, thyrsoids or panicles. *Petals* 4 or 5, yellow, white or red. *Sepals* 4 or 5, persistent. *Stamens* longer than the petals, numerous, free, usually in a single whorl, sometimes in two whorls, rarely more; sometimes interrupted opposite each calyx lobe. *Anthers* with a broad connective, gland-tipped, often with smaller glands elsewhere in the connective; filaments dorsifixed, the point of attachment enclosed by the connective. *Ovary* almost superior to half inferior, 2–6-locular (mostly 3–5), surrounded by or included in a saucer- or cup-shaped hypanthium. *Stigma* small, flat or slightly convex, narrower than the style. *Placentation* axile, the ovules attached to the centre of the axis or to a rod- or bracket-like placenta upright in the basal angle of, or projecting from, the axis horizontally or obliquely into the loculus. *Ovules* numerous, hemitropous, bilaterally flattened and accumbent to the axis or placenta and adhering to it along their edges. *Capsule* woody, globular, loculicidal, with the hypanthium partly enclosing, or flattened under, the fruit;

sepals persistent. *Seeds* flattened, semicircular to deltoid, occasionally winged at the chalazal end. *Embryo* with broad cotyledons lying face to face; hypocotyl accumbent.

LEAF ANATOMY: Hypodermis present, 1–3 cells deep. Secondary leaf veins supported adaxially by a column of sclerenchyma reaching through the palisade mesophyll to the hypodermis, and abaxially by collenchyma or sclerenchyma plus collenchyma. Petiole trace V- to very broadly U-shaped with oil glands very often present within the arc of the xylem.

A genus of over forty species. The name is derived from the Greek *xanthos*, 'yellow', and *stemon*, 'stamen', a reference to the yellow stamens of the type species, although red- and white-stamened species are not uncommon in the genus.

The genus *Nani* was described by Adanson (1763) who took the name from the Ambonese word given by Rumphius (Herbarium Amboinense 3: 16, t.7, 1743) for the species that he called 'Metrosideros vera'. This volume of Rumphius' work was published before the starting date for valid publication of names but his illustration constitutes the type of Adanson's genus.

The validity of the names in Adanson's publication under the present rules of nomenclature has recently been questioned by Parkinson (1987). The questions raised by Parkinson are still unanswered; however, Adanson's generic names have been treated as validly published for at least the past 50 years and this seems likely to remain the case (Nicolson, pers. comm.). In this paper, Adanson's name is treated as validly published; in the event of the rejection of his names, the following discussion and the synonymy given above would need amendment.

The first valid publication of Rumphius' species is *Metrosideros vera* Roxb. (Hort. Beng.: 37, 1814) based solely on Rumphius' illustration. Lindley's later publication of the same name (Collectanea Botanica t.18, 1821) also cited Rumphius' illustration (the type) and must, therefore, be considered to be an isonym (Nicolson 1975) and superfluous. Neither Roxburgh nor Lindley acknowledged Adanson's publication.

Miquel (1855) published the genus *Nania*, latinising the Ambonese 'Nani', independently of Adanson; the name is therefore new rather than an orthographic variant. Miquel's species, *Nania vera*, has been taken by some as a new combination of Adanson's and Roxburgh's names but Miquel gives no indication that he was aware of either publication. However, Miquel's species citation includes Rumphius' illustration so his genus is illegitimate since it includes the type of a previously published name (*Nani* Adanson) which ought to have been used.

The combination from Adanson's generic name and Roxburgh's specific epithet has never been made, but some combinations in *Nani* were made by Kuntze (1891). Kuntze took up Adanson's name, although he preferred the latinised form *Nania* (this *was* an orthographic variant), and applied it to the extremely broad concept of the genus *Metrosideros* favoured by Mueller in his Systematic Census of Australian Plants. This broad treatment was not accepted by any later botanist although Valeton (1901) did accept *Nania* Miq. as a genus distinct from *Metrosideros* and Merrill (1952: 156) supported this view, at least in principle.

The lack of any widespread usage of the name *Nani*, coupled with the conclusion that the genus had affinities with *Xanthostemon* rather than *Metrosideros*,

prompted Wilson and Dawson (1981) to propose that *Xanthostemon* be conserved against it. The Committee for Spermatophyta of the IAPT has voted to recommend conservation of the name *Xanthostemon* F. Muell. (Taxon 33: 298, 1984); this recommendation was ratified at the International Botanical Congress in Berlin.

Key to the Species of *Xanthostemon* in Australia

1. Flowers with distinct depressions ('vesicles') in the hypanthium opposite the petals 2

   Flowers lacking vesicles in the hypanthium 3

2. Flowers red; ovary densely pubescent ..... **1. X. youngii**

   Flowers greenish yellow; ovary glabrous ..... **2. X. formosus**

3. Placenta projecting more or less horizontally into the loculus; ovules forming a complete ring 4

   Placenta oblique to erect; ovules not forming a complete ring 9

4. Adult leaves opposite or in apparent whorls 5

   Adult leaves alternate (sometimes, in *X. whitei*, with some branchlets bearing opposite leaves) 7

5. Leaves opposite 6

   Leaves in apparent whorls of four ..... **3. X. verticillatus**

6. Flowers white; ovary hairy; bark scaly ..... **4. X. oppositifolius**

   Flowers yellow; ovary glabrous; bark persistent, rugose .. **5. X. xerophilus**

7. Hypanthium not enclosing the fruit at the base 8

   Hypanthium partly enclosing the fruit ..... **6. X. chrysanthus**

8. Calyx, corolla, stems and leaves glabrous or covered with a white tomentum; leaves obtuse, shortly petiolate ..... **7. X. paradoxus**

   Calyx, corolla, stems and leaves covered with a dense yellow-brown tomentum; leaves occasionally opposite, acute, distinctly petiolate ..... **8. X. whitei**

9. Petals ovate or elliptical; ovules attached at the apex of the placenta; seeds not winged 10

   Petals narrowly spathulate; ovules attached part-way up the axis; seeds winged 12

10. Adult leaves alternate 11

    Adult leaves opposite ..... **9. X. umbrosus**

11. Indumentum on young shoots golden brown; leaves 5.5–9.0 cm long, 2.5–4.0 cm wide ..... **10. X. psidioides**

    Indumentum on young shoots reddish brown; leaves 7.0–18.0 cm long, 4.0–10.0 cm wide ..... **11. X. graniticus**

12. Leaves sessile or nearly so ..... **12. X. eucalyptoides**

    Leaves petiolate ..... **13. X. crenulatus**

1. Xanthostemon youngii *C. White & Francis*, Proc. Roy. Soc. Queensland 37:159 (1926) Plate vi; Gugerli, Repert. Spec. Nov. Regni Veg., Beih. 120: 54 (1940).

HOLOTYPE: QUEENSLAND: Temple Bay, Cape York Peninsula, *J.E. Young AQ 316316*, vii.1923 (BRI).

Shrub (in heath communities) or tree with reddish brown, rough bark; young leaves and stems, floral parts and fruit white-pubescent. *Leaves* alternate in both juvenile and adult plants; petiole short, c. 0.5 cm long; lamina obovate to elliptical, 5–8 cm long and 1.5–3.5 cm broad, obtuse, glabrous, coriaccous with prominent venation. *Inflorescence* axillary, a monad or triad, borne at the apex of the seasonal growth unit. *Hypanthium* 17–18 mm broad, extending as a saucer around the ovary, with (4–) 5 distinct depressions (vesicles) opposite the petals. *Petals* 5, red, 7–10.5 mm long and up to 8 mm wide, finely pubescent, the margins ciliate. *Sepals* broadly triangular, 3–3.5 mm long. *Stamens* up to 25 mm long, in a continuous whorl around the rim of the hypanthium but drawn in towards the base of the ovary at the sides of the vesicles. *Ovary* almost superior, 3- to 5-locular, densely covered with hairs about 1 mm long. *Style* 15–20 mm long, terminal on the ovary; stigma not dilated, flat to convex. *Placentas* horizontal, bilaterally flattened. *Fruit* c. 15 mm in diameter; hypanthium everted under the capsule. *Seeds* not winged.

DISTRIBUTION: East coast of Cape York Peninsula, heath and low forest on sand dunes.

SELECTED SPECIMENS (2/9): QUEENSLAND: Cook District: Olive River, 12°10' S, 143°05' E, *Hyland 7440, 7450 & 7474*, 13.ix.1974 (QRS, UNSW); 3 km NW of Bolt Head, *Hind 4562*, 26.vii.1986 (NSW).

This is the only red-flowered species of *Xanthostemon* known in Australia. It has obvious affinities with *X. speciosus* Merr. from the Philippines (restricted to the continental Calamian-Palawan group) which also has a vesiculate hypanthium; the other red-flowered species, e.g. *X. ruber* from New Caledonia, *X. verdugonianus* from the Philippines, *X. novoguineensis* from New Guinea, and *X. confertiflorus* from Sulawesi, are not necessarily closely related either to *X. youngii* or to each other.

There have been occasional references to this species as '*X. youngiae*' (see, e.g., Lavarack & Godwin, 1987). There is no justification for this since the person after whom the species was named, J.E. Young, was a male.

Fruiting specimens of a plant resembling this species have been collected in similar communities near Cape Flattery; however, there are unconfirmed reports that this entity has yellow flowers.

2. Xanthostemon formosus *Peter G. Wilson*, **sp. nov.**

Arbor media, cortice squamoso. Folia juniora adultaque alterna, glabra, laminis plerumque 12–22 cm longis et 2–4.5 em latis, chartaceis, acuminatis. Flores flavovirentes, petalis suborbicularis 1.5–1.8 cm latis, hypanthio vesiculato, ovario glabro, placentis horizontalibus. Capsula minute verrucosa; semina non alata.

HOLOTYPE: QUEENSLAND: Cook District: Portion 49V, Portion of Alexandra, Cooper Creek, 16°10' S, 145°25' E, *Gray 3366*, 26.iv.1984 (NSW). ISOTYPES: QRS, BRI.

Tree to 18 m tall and 30 cm d.b.h., with grey flaky bark. *Leaves* alternate in both juvenile and adult plants; petiole 0.5–1.5 cm long, becoming swollen at the base; lamina narrowly elliptical to oblanceolate, (9–)12–22 cm long and

2–4.5 cm broad, acuminate, glabrous, discolorous, chartaceous, midvein sunken above, prominent below, lateral veins and intramarginal vein conspicuous; oil glands numerous. *Inflorescence* an aggregation of monads at the apex of the shoot, subtended by reduced foliage leaves. *Hypanthium* 1.5–2 cm broad, saucer-like but with 5 distinct depressions (vesicles) opposite the petals. *Petals* 5, greenish yellow, suborbicular, 1.5–1.8 cm in diameter, glabrous, the margin irregular. *Sepals* yellowish, triangular to oblong, 0.7–1.0 cm long and 0.4–0.7 cm broad. *Stamens* c. 25, in a single series around the rim of the hypanthium, filaments 2–2.5 cm long. *Ovary* almost superior, (2- to) 3-locular, glabrous. *Style* 1.5–2.5 cm long, terminal on the ovary, persistent; stigma not dilated, flat to slightly convex. *Placentas* horizontal, bilaterally flattened. *Fruit* 1.5–2 cm in diameter, the surface minutely verrucose; hypanthium everted under the capsule. *Seeds* not winged. (Fig. 2)

DISTRIBUTION: Known only from the area around Cooper Creek (between Noah Creek and the Daintree River) where it occurs in rainforest along the creek.

SELECTED SPECIMENS (2/8): QUEENSLAND: Cook District: Cooper Creek, *Gray 3345*, 14.iii.1984 (QRS); *Sankowsky 574*, 16.xii.1986 (NSW).

This remarkable species is the first one known to have both a vesiculate hypanthium and yellow flowers. Apart from the vesiculate hypanthium it does not particularly resemble *X. youngii*; the leaves are chartaceous rather than coriaceous, acuminate rather than acute to obtuse, the ovary is glabrous rather than densely pubescent, the capsule minutely verrucose rather than ± smooth and the style is markedly persistent. It can easily be distinguished from all other Australian yellow- or white-flowered species by the vesiculate hypanthium and the much larger perianth segments.

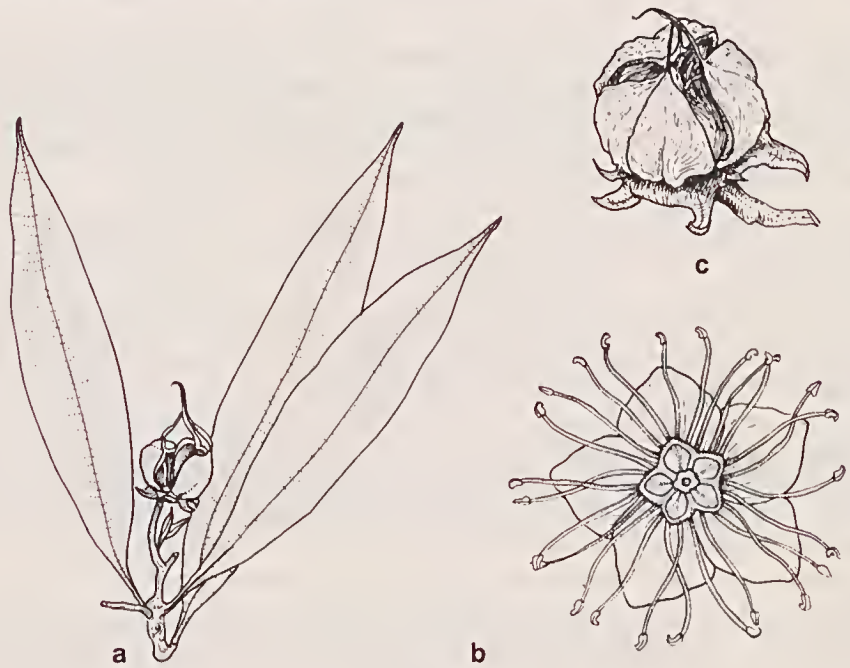

Fig. 2. *Xanthostemon formosus* Peter G. Wilson. **a** habit (x 0.4). **b** flower (x 0.8). **c** fruit (x 1.2). (**a**, **c** from *Gray 4340*; **b** from *Gray 3366*).

3. Xanthostemon verticillatus *(C. White & Francis) L.S. Smith*, Proc. Roy. Soc. Queensland 67: 38 (1955).

BASIONYM: *Metrosideros verticillata* C. White & Francis, Queensland Dept. Agric. Bot. Bull. 22: 24 (1920).

HOLOTYPE: QUEENSLAND: 'Bloomfield River', *W. Poland AQ 342056*, xi.1902 (BRI 36326, 36327).

Tree with tessellated, flaky bark; branchlets show sympodial growth, apparently due to regular abortion of the apical buds after flowering. *Leaves* mostly in apparent whorls of (3–)4(–5); petiole 0.5–0.8 cm long; lamina narrowly oblanceolate 4–9 cm long and (0.5–)0.8–1.3 cm broad, obtuse or sometimes mucronate at the apex, decurrent to the rather short petiole; oil glands numerous, oil yellow to orange. *Inflorescence* axillary triads, glabrous except for a faint pubescence on the sepals and petals; peduncles flattened or angular, 8–16 mm long; pedicels slender, 8–14 mm long. *Hypanthium* cup-shaped, contracted at the orifice, 5–7 mm in diameter, exceeding the top of the ovary. *Petals* 5, cream, ovate-orbicular, 5–7 mm long. *Sepals* triangular, 2–3.5 mm long. Stamens numerous, 2–2.5 cm long. *Ovary* almost superior, 3- to 4-locular, glabrous. *Style* longer than the stamens, 2.5–3.5 cm long, inserted in a depression in the ovary summit; stigma not dilated. *Placentas* horizontal with the ovules arranged in a complete ring. *Fruit* woody, 10–11 mm in diameter, with a distinct depression in the centre, hypanthium enclosing the basal part of the fruit and somewhat constricting it. *Seeds* not winged.

DISTRIBUTION: The only precisely known locality is the Daintree Logging Area where the species is a rheophyte in rainforest.

SPECIMEN EXAMINED: QUEENSLAND: Cook District: T.R. 165, Daintree L.A., 16°09' S, 145°17' E, *Hyland 3920 RFK*, 29.x.1978 (NSW, QRS).

The type collection consists of four elements, now mounted on two sheets at BRI. The protologue was accompanied by a photograph of one element (left hand specimen on sheet BRI 36327). Since these specimens are clearly all from one gathering and all were in the possession of the authors when the description was drawn up, I have treated the entire collection as holotype.

B. Hyland (pers. comm.) has not found this species in the Bloomfield River area; the type 'locality' given is probably a reference only to the Rev. W. Poland's address.

The collector's notes on the recent collection state that the flowers have 'a distinct odour of freshly cut purple passionfruit skin'. The species is the only *Xanthostemon* known to have verticillate leaves.

4. Xanthostemon oppositifolius *F.M. Bailey*, Cat. Indig. Nat. Pl. Queensland: 109 (1890), Queensland Fl. 2: 642 (1900); Gugerli, Repert. Spec. Nov. Regni Veg., Beih. 120: 58 (1940); W.D. Francis, Australian Rain-Forest Trees, edn 2: 329 (1951).

HOLOTYPE: QUEENSLAND: Noosa, *A. F. Luya AQ 316328* (BRI).

Tall tree, to c. 40 m with scaly bark that is shed in flakes; young shoots and inflorescences very finely hairy. *Leaves* opposite (occasionally subopposite) in the adult; petiole 0.5–1.5 cm long; lamina ovate to elliptical or broadly lanceolate, 4–9(–11) cm long and (1.5–)2.5–5.5 cm broad, often shortly attenuate at the base, obtuse to rounded at the apex, coriaceous, veins prominent in dried specimens. *Inflorescence* an axillary triad, botryoid or metabotryoid;

flowers 3–9(–11) per inflorescence, white; peduncles 2–4 cm long; pedicels 1–2 cm long. *Hypanthium* 5–7 mm in diameter, dish-shaped with its rim approximately at the level of the ovary summit. *Petals* (4–)5, orbicular, 4–6 mm long. *Sepals* deltoid to oblong, 2–5 mm long, 2.5–3.5 mm broad. *Stamens* numerous, 8–10 mm long. Ovary more than half superior, 3- or 4- (rarely 2-) locular, densely covered with very short, pale hairs. *Style* about 10 mm long, inserted in a depression on the ovary summit; stigma narrower than the style. *Placentas* sub-central, arms slightly ascending, projecting into the centre of the loculus; the ovules forming a complete ring. *Fruit* woody, broadly ovoid, 10–13 mm in diameter; hypanthium enclosing the base of the fruit. *Seeds* not winged.

DISTRIBUTION: South-eastern Queensland, between Maryborough and Nambour, in rainforest.

SELECTED SPECIMENS (2/16): QUEENSLAND: Wide Bay District: Kaurivale, *Hyland 6675*, 23.i.1973 (QRS); 1.9 km along Bates Road from the Kin Kin road, *Beesley 955A & Ollerenshaw*, 10.xii.1986 (CBG, MEL, NSW).

5. Xanthostemon xerophilus *Peter G. Wilson*, **sp. nov.**

Arbor cortice cinereo, rugosissimo. Folia juvenilia alterna, adulta opposita et decussata, laminis 6–11 cm longis et 2.5–5.5 cm latis, coriaceis, punctis glandulosis aurantiacis. Inflorescentia axillaris, botryoidalis. Flores luteoli, hypanthio late cupulato, staminibus numerosis, uniseriatis sed ante petala biseriatis, ovario glabro, placenta horizontali. Capsula globosa, brunneola-armeniaca, 1.0–1.4 cm diametro, 3–4-locularis; semina non alata.

HOLOTYPE: QUEENSLAND: Cook District: ca 45 miles S of Cape York, 11°19'S, 142°25'E, *Pedley 2737*, 27.vi.1968 (NSW). ISOTYPE: BRI.

Tree to 16 m tall with grey, hard, very rugose, somewhat tessellated bark; the young stems angular and yellowish tomentose. *Leaves* of juvenile plants alternate, of adults opposite and decussate, rarely subopposite; petiole 0.5–1.8 cm long; lamina broadly obovate to oblong-elliptical (4.5–)6–9(–11) cm long, 2.5–5.5 cm broad, margin undulate and the apex obtuse or shortly acuminate, discolorous, coriaceous, glabrous; midvein concave above, prominent below, venation reticulate, prominent below; oil glands numerous, oil orange. *Inflorescence* axillary, a 7–11-flowered botryoid, pedicels 1.2–1.7 cm long, peduncles covered in a fine, golden-brown tomentum. *Hypanthium* broad-cupulate, 5–7 mm in diameter, the rim extending beyond the top of the ovary. *Petals* 5, pale yellow, ovate, 4–5 mm long, 4–6 mm broad. *Sepals* 5, 2–2.5 mm long, deltoid to oblong, sparsely pubescent. *Stamens* numerous, 1.5–2 cm long, uniseriate (biseriate opposite the petals). *Ovary* 3–4-locular, half inferior, glabrous. Style 2–2.5 cm long, inserted in a depression on the ovary summit. *Placentas* rod-like, terete, horizontal, reaching the ovary wall and bearing numerous ovules in an uninterrupted whorl on the margin of the slightly dilated apex. *Fruit* brownish orange when ripe, globose, 1.0–1.4 cm in diameter; hypanthium everted or partly enclosing the base of the fruit. *Seeds* not winged, 4–5 mm long. (Fig. 3)

DISTRIBUTION: Cape York Peninsula, north and south of the Jardine River in layered open forest with *Eucalyptus tetrodonta* and *E. nesophila* (community 2b of Pedley & Isbell (1971); 5b of Lavarack & Stanton (1977)).

SELECTED SPECIMENS (3/12): QUEENSLAND: Cook District: Jardine River, *Brass 18901*, 21.v.1948 (CANB); 16 km S. Jardine R., *Wilson & Waterhouse UNSW 2734, 2735*, 5.x.1973 (NSW, UNSW).

Early specimens of this species were distributed as *Metrosideros* sp. aff. *tetrapetala* (i.e. *X. umbrosus*) to which it is superficially similar. Lavarack and Stanton (1977) erroneously refer this species to *X. paradoxus*.

The epithet refers to the preference shown by this species for the drier, open forest in contrast to the other Cape York species which usually occur in moister coastal or riparian situations.

6. Xanthostemon chrysanthus *(F. Muell.) Benth.*, Fl. Austral. 3: 268 (1867); F.M.Bailey, Queensland Flora 2: 641 (1900); Gugerli, Repert. Spec. Nov. Regni Veg., Beih. 120: 79 (1940).

BASIONYM: *Metrosideros chrysantha* F. Muell., Fragm. 4: 159 (1864).

LECTOTYPE (here designated): QUEENSLAND: Rockingham Bay, *Dallachy*, 12.iv.1864 (MEL 63325).

SYNONYM: *Nani chrysantha* (F. Muell.) O. Kuntze, Rev. Gen. Pl. 1: 242 (1891) as 'Nania'.

Tall tree with fairly smooth, hard, grey bark, decorticating in hard scales or strips; twigs and shoots usually sparingly pubescent or glabrous. *Leaves* alternate in both juvenile and adult plants; petiole short, up to 1 cm long; lamina lanceolate to oblanceolate, (7–)10–15(–20) cm long and (2–)3–4.5(–7) cm broad, acute, chartaceous to coriaceous; oil glands sometimes containing red oil. *Inflorescence* axillary, a monad, triad or, sometimes, a metabotryoid, borne at the apex of the seasonal growth unit. *Hypanthium* cup-shaped, c. 5 mm broad, extending well beyond the ovary summit. *Petals* 4–5, yellow, ovate to orbicular, 7–9 mm long. *Sepals* yellowish, triangular, 3–3.5 mm long. *Stamens* numerous,

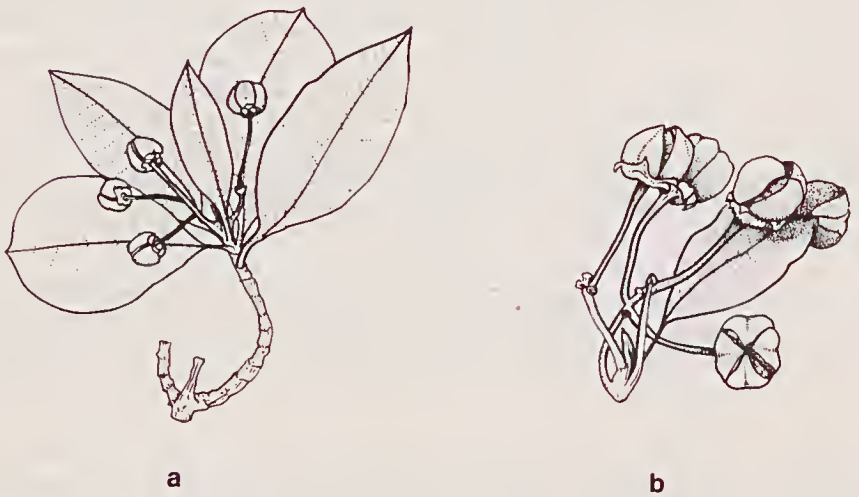

Fig. 3. *Xanthostemon xerophilus* Peter G. Wilson. a habit (x 0.4). b fruit (x 0.8). (a from *Benson 576*; b from *UNSW 2735*).

in one whorl, (15–)20–30 mm long. *Ovary* nearly superior, (2–)3(–4)-locular. *Style* (25–)30–40 mm long as long as or longer than the stamens, terminal or inserted in a shallow depression on the ovary summit, the base persistent; stigma small, convex. *Placentas* horizontal. *Fruit* 9–15 mm in diameter; hypanthium usually enclosing basal ⅓–½ of the fruit. *Seeds* not winged.

DISTRIBUTION: Coastal Queensland, between 12° S and 19° S, mostly in riparian forest.

SELECTED SPECIMENS (6/56): QUEENSLAND: Cook District: Junie Ck, *Dockrill 571*, 14.x.1972 (BRI, QRS); Shiptons Flat, *Brass 20202*, 12.ix.1948 (BRI, CANB); Cooper Ck, *Hyland 5995*, 11.iv.1972 (BRI, QRS); S.F.R. 756, Downey Ck, *Hyland 5603*, 1.xi.1971 (BRI, QRS, UNSW). North Kennedy District: Murray Falls, c. 23 km SW Euramo, *Boyland & Gillieat 637*, 29.xi.1967 (BRI); Wallaman Falls, *Vessey 154*, 14.ix.1963 (BRI).

7. Xanthostemon paradoxus *F. Muell.*, Hooker's J. Bot. Kew Gard. Misc. 9: 17 (1857), Fragm. 1: 80 (1859); Bentham, Fl. Austral. 3: 269 (1867); Gugerli, Repert. Spec. Nov. Regni Veg., Beih. 120: 81(1940).

LECTOTYPE (here designated): NORTHERN TERRITORY: Sea Range, Victoria River, *F. Mueller* xii.1855 (MEL 63369).

SYNONYMS: *Metrosideros paradoxa* (F. Muell.) F. Muell., Fragm. 1: 243 (1859).

Nani paradoxa (F. Muell.) O. Kuntze, Rev. Gen. Pl. 1: 242 (1891) as 'Nania'.

Tree with thick, grey, persistent, rugose bark; branchlets and twigs pubescent to glabrous. *Leaves* alternate in both juvenile and adult plants; lamina elliptical, 5–16(–18) cm long and 3–6(–7) cm broad, obtuse, pubescent or glabrescent. *Inflorescence* axillary, a triad or metabotryoid, borne at the end of the seasonal growth unit, often aggregated as a pseudoterminal conflorescence. *Hypanthium* cup-shaped, 4–6 mm in diameter, exceeding the top of the ovary. *Petals* 5, elliptical, c. 5 mm long, yellow. *Stamens* in one whorl, yellow, rigid, 17–25 mm long. *Ovary* almost superior, 2–3- (rarely 4-) locular. *Style* 20–40 mm long, extending approximately as far as the ends of the stamens, inserted in a shallow depression on the ovary summit; stigma narrower than the style, convex. *Placentas* horizontal. *Fruit* 8–14 mm in diameter; hypanthium flattened under the fruit. *Seeds* not winged.

DISTRIBUTION: Kimberley Division of Western Australia and the Northern Territory; in savannah woodland or on rocky hills.

SELECTED SPECIMENS (9/116): WESTERN AUSTRALIA: Kimberley Division: Kalumburu, *Maconochie 1253*, 30.v.1971 (BRI, CANB, NT, PERTH); Marigui Promontary, *Kenneally 2164*, 27.viii.1974 (PERTH); 26 km E. Kununurra, *Beard 4296*, 3.vi.1965 (NSW, PERTH). NORTHERN TERRITORY: 47 miles (c. 76 km) N. Oenpelli, *Chippendale*, 16.vii.1961 (AD, BRI, CANB, MEL, NSW, NT); Nourlangie Rock, *Schodde AE24*, 3.v.1972 (CANB, DNA, NT); 6 miles (c. 9.7 km) S. Adelaide River, *Lazarides 6967*, 6.xii.1963 (BRI, CANB, NSW, NT); 23 miles (c. 37 km) NE. 'Tipperary', *Lazarides 6690*, 28.vii.1961 (AD, BRI, CANB, NSW, NT); Silver Mine Ck, Daly R. road, *Byrnes 11*, 3.xi.1966 (AD, NT); near Alligator Springs, 70 miles (c. 113 km) E. 'Carlton Hill', *Perry 2614*, 27.vii.1949 (AD, BRI, CANB, NSW, NT).

Herbarium specimens show a wide range of variation but detailed field observations, particularly in the Northern Territory, are required before a satisfactory taxonomic resolution can be achieved. Amongst the Australian populations, at least three distinct groups are discernible: (1) specimens collected on or around rocky outcrops have pubescent leaves 5–11 cm long, thin-walled pale brown fruits 0.8–1 cm in diameter with the style usually set slightly into the top, and pale yellow semi-persistent stamens; (2) specimens collected

in savannah woodland have glabrous to pubescent leaves 8–16 cm long, red-brown fruits 1.1–1.4 cm in diameter with the style terminal on the summit, and dark yellow deciduous stamens; and (3) specimens from low open woodland are similar to form 2 but always have tomentose leaves and fruit with a tardily dehiscent, heavily thickened pericarp markedly adnate to the remnants of the hypanthium. The limits of these 'forms' are unknown and there are still other specimens, from scattered localities, which are different again from any of these (e.g. *Webb & Tracey 13194* from Melville Island, *Webb & Tracey 12480A* from Katherine River, and *Barnett & Azzopardi 4* from Mt Brockman); these also need to be investigated.

In choosing a lectotype I have followed Merrill (1952: 155) who accepted the only collection available to him as typical but did not formally designate a specimen as type. The protologue was based on two different collections and Merrill had access to only one of these, a plant with "distinctly pubescent leaves, and densely cinereous-pubescent inflorescences" (specimens at K and G). Merrill described the savannah woodland populations from New Guinea, previously identified as *X. paradoxus*, as the new species *X. brassii* ; this taxon is closely related to *X. paradoxus* but is specifically distinct in habit, flowering phenology and indumentum.

8. Xanthostemon whitei *Gugerli*, Repert. Spec. Nov. Regni Veg., Beih. 120: 83 (1940) as 'whitii'; Merrill, J. Arnold Arbor. 33: 154 (1952).

SYNONYM: *Xanthostemon pubescens* C. White, Proc. Roy. Soc. Queensland 29: 57 (1917), *nom. illeg., non* Pampaloni, Nuovo Giorn. Bot. Ital. II, 13: 128 (1906).

HOLOTYPE: QUEENSLAND: Mazlins Creek, Herberton District, *J.F. Bailey AQ 316314* (BRI). ISOTYPE: MEL.

Tree up to 40 m tall with grey scaly bark; branchlets, inflorescences and under-surfaces of the leaves covered with a dense yellow-brown indumentum. *Leaves* alternate in the juvenile, alternate or sometimes opposite on some branchlets in the adult; petiole 1–2 cm long; lamina lanceolate, 7–16(–19) cm long and 3–5(–7.5) cm wide. *Inflorescence* an axillary triad, botryoid or metabotryoid. *Hypanthium* cup-shaped, 5–7 mm in diameter, extending beyond the top of the ovary. *Petals* (4–)5, elliptical, 4–5 mm long, creamy yellow. *Sepals* (4–)5, triangular to oblong, 3–4 mm long. *Stamens* yellow, numerous, in one whorl, 15–25 mm long. *Ovary* half inferior, 3- to 4-locular, glabrescent. *Style* 20–30 mm long, inserted in a depression on the ovary summit; stigma small, much narrower than the style. *Placenta* horizontal. *Fruit* 1–1.5 cm in diameter; hypanthium enclosing the base of the fruit. *Seeds* not winged.

DISTRIBUTION: North Queensland, Atherton Tableland region, in closed forest communities on basaltic red earths, on brown and yellow earths or on volcanic alluvium (Tracey 1982).

SELECTED SPECIMENS (2/22): QUEENSLAND: Cook District: S.F.R. 191, Barron L.A., *Hyland 6002*, 18.iv.1972 (BRI, QRS); Mena Creek, Paronella Park, *Smith 3711A*, 5.viii.1948 (BRI).

9. Xanthostemon umbrosus *(A. Cunn. ex Lindl.) Peter G. Wilson & Waterhouse*, Austral. J. Bot. 30: 444 (1982).

BASIONYM: *Tristania umbrosa* A. Cunn. ex Lindl., Bot. Reg. *sub* t.1839 (1836); Bentham, Fl. Austral. 3: 265 (1867).

HOLOTYPE: WESTERN AUSTRALIA: Shores of York Sound, *A. Cunningham* 16.ix.1820 (CGE). ISOTYPES: BM, K.

SYNONYMS: *Metrosideros tetrapetala* F. Muell., Fragm. 7: 41 (1869).

LECTOTYPE (here designated): QUEENSLAND: Cave Creek, Gilbert River, Daintree. (MEL 63313, left hand element).

Nani tetrapetala (F. Muell.) O. Kuntze, Rev. Gen. Pl. 1: 242 (1891) as 'Nania'.

Tree with grey, scaly bark. *Leaves* alternate in juvenile plants, opposite in adults; petiole 0.8–1.5 cm long; lamina elliptical, 5–8 cm long and 2–4.5 cm broad, obtuse, emarginate or mucronate. *Inflorescence* axillary, a cyme or botryoid; flowers usually 3–7 per inflorescence. *Hypanthium* 5.5–7 mm in diameter, a shallow dish with its rim at, or slightly below, the level of the ovary summit. *Petals* 4, rarely 5, cream, elliptical, 4–6 mm long and 3–4 mm broad. *Sepals* triangular, 2–4 mm long. *Stamens* numerous, 10–13 mm long, in 1–2 whorls (1 whorl opposite the sepals, 2 opposite the petals), filaments 2.5–6.0 mm long. *Ovary* half inferior, 3–4-locular. *Style* equal to or longer than the stamens, inserted in a depression on the ovary summit; stigma small, convex. *Placentas* axile, oblique, laterally flattened, bearing c. 14 ovules in an incomplete ring. *Fruit* globular, woody, 8–12 mm in diameter, dehiscence lines much paler than the red-brown fruit; hypanthium flat to everted under the fruit; sepals persistent, prominent. *Seeds* not winged.

DISTRIBUTION: Northern Australia, from Cape York Peninsula across to the Kimberley region of Western Australia.

SELECTED SPECIMENS (6/34): WESTERN AUSTRALIA: Kimberley Division: Upper reaches of Hunter R., *Kenneally 8966*, 9.vi.1984 (NSW, PERTH). NORTHERN TERRITORY: 8 miles (c. 13 km) SE. East Alligator R. crossing, *Byrnes 1953*, 29.vii.1970 (DNA, NT); Groote Eylandt, *Levitt*, 10.iii.1973, iv.1973 (BRI, DNA). QUEENSLAND: Cook District: Olive River, *Hyland 3070 RFK*, 13.ix.1975 (NSW, QRS); Tozers Gap, Tozer Range, *Brass 19416*, 2.vii.1948 (BRI, CANB, K); Gugu Yulangi main camp, *Hyland 8082*, 8.iii.1975 (NSW, QRS, UNSW).

The species has only recently been re-collected (vegetative material only) from the region where Cunningham collected the type. It is still poorly known throughout its range, and very few flowering specimens exist. The specimens show a great deal of variation, particularly in leaf shape, fruit size and habitat, and may represent more than one taxon. I am maintaining it as a single variable taxon until a fuller range of material is available.

This species (or species complex) is not closely related to any other Australian species; it is clearly distinct in having the obliquely inserted placenta. The nearest allies to this taxon are *Xanthostemon* sp. ("kasi kasi") from New Guinea and *X. petiolatus* from Sulawesi (described from a tree being grown at Bogor from seed supposedly originating in Java, but the species is not known from there).

10. Xanthostemon psidioides *(A.Cunn. ex Lindl.) Peter G. Wilson & Waterhouse*, Austral. J. Bot. 30: 444 (1982).

BASIONYM: *Tristania psidioides* A. Cunn. ex Lindl., Bot. Reg. *sub* t.1839 (1836); Bentham, Fl. Austral. 3: 264 (1867).

HOLOTYPE: WESTERN AUSTRALIA: Ravines of Regent River, Brunswick Bay, *A. Cunningham*, 10.x.1820 (CGE; not seen). ?ISOTYPE: K (dated ix.1820).

Small tree, up to 8 (rarely to 15) m tall, with dark, grey-black, tessellated bark; young stems and leaves covered with a golden brown indumentum, becoming

grey with age. *Leaves* alternate in both juvenile and adult plants; petiole (0.7–) 1.0–1.8 cm long; lamina elliptical, (3.5–)4.5–9.0(–11.5) cm long by (1.5–) 2.0–4.0(–5.8) cm broad, apex obtuse and rounded to acute; oil glands obscure. *Inflorescence* an axillary panicle or metabotryoid, branching disjunct opposite; peduncle 2–3 cm long; pedicels and floral parts finely pubescent. *Hypanthium* broad and shallow, 5–6 mm in diameter, extending like a saucer around the ovary. *Petals* 5, cream, ovate to orbicular, 3–4 mm long. *Sepals* (narrowly) triangular, 2–3 mm long, persistent. *Stamens* numerous, in one whorl, slightly interrupted in front of each sepal, 8–12 mm long. *Ovary* almost superior, 3-locular, tomentose. *Style* approximately as long as the stamens; stigma convex. *Placentas* upright, ovules attached near the apex. *Fruit* small, grey-tomentose, 6–7 mm in diameter; hypanthium enclosing basal ¼ of the fruit. *Seeds* not winged.

DISTRIBUTION: Disjunct between the Kimberley region of Western Australia and the Arnhem Land escarpment of the Northern Territory.

SELECTED SPECIMENS (6/22): WESTERN AUSTRALIA: Kimberley Division: Marigui Promontory, Brunswick Bay, *Kenneally 2148*, 27.viii.1974 (PERTH); Sale R., *Kenneally 9675*, 16.v.1986 (NSW, PERTH). NORTHERN TERRITORY: Wessell Islands, *Latz 3474*, 12.x.1972 (BRI, CANB, NT); c. 9 km NE. Jabiru, *Adams & Richardson 3037*, 19.ii.1973 (CANB, NSW); Deaf Adder Gorge, *Fox 2522*, 22.ii.1977 (DNA, CANB, MEL, NSW, NT); Koolpin Creek, *Dunlop 4278*, 29.ix.1976 (DNA, NSW).

11. Xanthostemon graniticus *Peter G. Wilson*, **sp. nov.**

Arbor parva vel media, cortice tessellato. Folia juniora indumento cinnamomeo mox supra glabrescentia, adulta alterna, laminis plerumque 7–18 cm longis et 4–10 cm latis, rigido-coriaceis, rugosis. Inflorescentia axillaris, metabotryoidalis. Flores cremei, hypanthio 7.8–8.0 mm diametro, ovario indumento cinnamomeo, placenta plus minusve erecta. Capsula 7–9 mm diametro; semina non alata.

HOLOTYPE: QUEENSLAND: Cook District: head of Roaring Meg Creek, 16°07' S, 145°24' E, *M. Godwin C2826*, 2.iii.1985 (NSW). ISOTYPES: BRI, QRS.

Tree to 13 m tall with dark brown flaky bark. *Leaves* alternate in adult plants; petiole 1–2.5 cm long; lamina elliptical, 7–18(–22) cm long and (3–)4–10(–12) cm broad, stiffly coriaceous, apex acute to shortly acuminate, indumentum pale red-brown to greyish when young, soon glabrescent above, becoming greyer and sparser below; midvein and main lateral veins sunken giving the lamina a rugose appearance, margins recurved; oil glands numerous. *Inflorescence* a metabotryoid, axillary, branching opposite to disjunct opposite; peduncle 2–3 cm long. *Hypanthium* broad and shallow (dish-like), 7–8 mm in diameter, the rim exceeding the ovary summit. *Petals* 5, cream, ovate to orbicular, 4.0–4.4 mm long and 3.8–4.0 mm wide, containing numerous oil glands, pubescent on the outer surface. *Sepals* 5, triangular, 2.8–3.2 mm long and 1.9–2.7 mm wide, pubescent on the outer surface. *Stamens* numerous, (5–)7–10 mm long, uniseriate, filaments free, anthers dorsifixed, the point of attachment enclosed by the broad connective which has a large gland at the apex and 1–3 smaller glands on each side. *Ovary* half inferior, (2–)3-locular, covered with a short, dense, reddish brown indumentum. *Style* up to 12 mm long, inserted in a depression in the ovary summit; stigma narrower than the style, flat. *Placentas* upright, ovules c. 10 per loculus, attached near the apex. *Fruit* depressed-globular, 7–9 mm in diameter, grey-tomentose; hypanthium enclosing the base of the fruit. *Seeds* not winged, c. 4 mm long. (Fig. 4)

DISTRIBUTION: Known so far from only three localities in the vicinity of Mount Pieter Botte, inland from Cape Tribulation, Queensland; it grows in open areas of mossy Araucarian-notophyll vine forest on creek banks in peaty soil on granite.

This species is most closely related to *Xanthostemon psidioides* from the Northern Territory and Western Australia. It differs from that species in its cinnamon-coloured indumentum and its rugose and coriaceous leaves. These two species constitute a distinct group which has no close affinities with any other Australian species; possible links with Malesian species have yet to be investigated.

As far as can be ascertained, the species is unique in the genus in its ecology; no other is recorded as growing on granite rocks.

12. Xanthostemon eucalyptoides F. Muell., Fragm. 1: 81 (1859).

LECTOTYPE (here designated): NORTHERN TERRITORY: Fitzmaurice River, *F. Mueller*, x.1855. (MEL 63296).

SYNONYMS: *Metrosideros eucalyptoides* (F. Muell.) F.Muell., Fragm. 1: 243 (1859); Bentham, Fl. Austral. 3: 267 (1867).

Nani eucalyptoides (F. Muell.) O. Kuntze, Rev. Gen. Pl. 1: 242 (1891) as 'Nania eucalyptodes'.

Tree up to 18 m tall with persistent, grey, fine-textured bark; young stems quadrangular. *Leaves* alternate in juvenile plants; opposite in adults; sessile or subsessile, petiole up to 0.2 cm long; lamina elliptical-oblong, somewhat

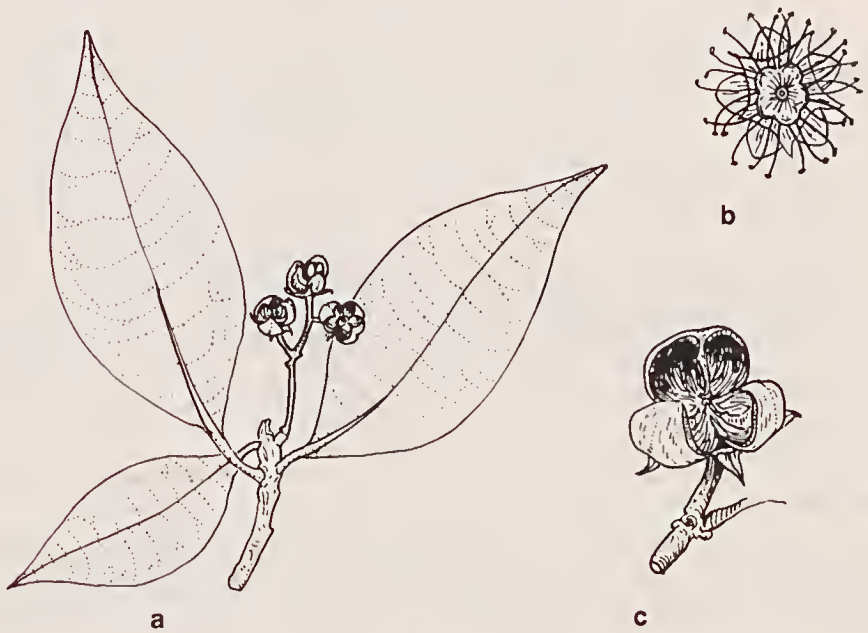

Fig. 4. *Xanthostemon graniticus* Peter G. Wilson. **a** habit (x 0.5). **b** flower (x 1). **c** fruit (x 2). (**a, c** from *Godwin C2574*; **b** from *Godwin C2826*).

cordate, mostly 5–12 cm long and 3–7 cm broad, obtuse, glabrous. *Inflorescence* an axillary panicle or metabotryoid with opposite branching, covered with a very fine indumentum; peduncles quadrangular; flowers numerous, c. 21 per inflorescence. *Hypanthium* broad and shallow, 4–5.5 mm in diameter. *Petals* 4(–5), linear to spathulate, 3–3.5 mm long and 1–1.5 mm broad, cream. *Sepals* linear, 2–2.5 mm long and 0.5 mm broad. *Stamens* numerous, in 1–2 whorls, 4.5–8.5 mm long. *Ovary* almost superior, (2–)3–4-locular. *Style* longer than the stamens, about 10 mm long, inserted in a depression on the ovary summit; stigma narrow, flat to convex. *Placentas* upright, ovules 8–10 per loculus, attached mid-way up the placenta. *Fruit* thin-walled, ovoid, about 6 mm in diameter; hypanthium everted under the fruit. *Seeds* winged; wing distal to the raphe.

DISTRIBUTION: Northern Territory and Western Australia in higher rainfall areas; almost always found near streams, on swampy ground, or on ground subject to seasonal inundation.

SELECTED SPECIMENS (4/30): WESTERN AUSTRALIA: Kimberley Division: Surveyor Falls, Mitchell Plateau, *George 13131*, 18.i.1975 (PERTH). NORTHERN TERRITORY: Oenpelli, *Specht 1244*, 22.x.1948 (AD, BRI, CANB, MEL, NSW); George Ck., Stuart Highway, *Byrnes 541*, 5.x.1967 (AD, DNA, NT); UDP Falls, *Martensz AE 533*, 24.i.1973 (BRI, CANB, NSW).

13. Xanthostemon crenulatus *C. White*, J. Arnold Arbor. 23: 82 (1942); Merrill, J. Arnold Arbor. 33: 156 (1952).

HOLOTYPE: PAPUA: Gaima, Lower Fly River, *Brass 8358*, xi.1936 (BRI).

Tree 10–20 m tall; bark grey, thick, the surface breaking up into corky flakes; young stems flattened, glabrous. *Leaves* opposite in the adult; petiole 1–1.5 cm long; lamina elliptical-oblong, 9–17 cm long and 6–11 cm broad, obtuse, emarginate or mucronate, margins crenulate. *Inflorescence* usually an axillary metabotryoid or panicle with opposite branching, covered with a fine indumentum; peduncle flattened; flowers numerous, c. 15 per inflorescence. *Hypanthium* broad and saucer-shaped, 4.5–6.5 mm in diameter. *Petals* 4(–5), cream, spathulate, 3.5–4.5 mm long and 2 mm broad. *Sepals* oblong, 2–2.5 mm long and 1–1.5 mm broad. *Stamens* numerous, 2.5–8 mm long, in (1–)2 whorls slightly interrupted opposite the sepals. *Ovary* almost superior, 3–4-locular. *Style* longer than the stamens, 8–10 mm long, inserted in a depression on the ovary summit; stigma convex. *Placentas* upright, ovules 9–11 per loculus, attached mid-way up the placenta. *Fruit* thin-walled, broadly ovate, about 7 mm in diameter; hypanthium flat to everted under the fruit. *Seeds* winged, wing distal to the raphe.

DISTRIBUTION: South-western Papua, and Cape York Peninsula as far south as the Cooktown area, common in forest adjacent to watercourses.

SELECTED SPECIMENS (4/31): PAPUA NEW GUINEA: Western District: near Morehead Patrol Post, *Pullen 7198*, 30.viii.1967 (BRI, CANB, LAE). QUEENSLAND: Cook District: Galloway Ck., Bamaga district, *Webb & Tracey 6047*, 4.v.1962 (BRI); Iron Range, *Brass 19140*, 11.vi.1948 (BRI, CANB); Muck R., Bathurst Bay, *Hyland 6304*, 27.vii.1972 (QRS).

This species is very closely related to *X. eucalyptoides* from which it differs in bark, leaf shape and petiole length. The two species are geographically isolated.

Excluded Australian binomials

X. brachyandrus C. White, Proc. Roy. Soc. Queensland 53: 219 (1942) = *Lindsayomyrtus brachyandrus* Hyland & Steen., Blumea 21: 189 (1973).

X. pachyspermus F. Muell. & F.M. Bailey, Occas. Pap. Queensland Fl. 1: 4 (1886) = *Ristantia pachysperma* Peter G. Wilson & Waterhouse, Austral. J. Bot. 30: 443 (1982).

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This index lists specimens by collector's name and collecting number (or date of collection for unnumbered collections); the numbers in parentheses refer to the species in the text.

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Bailey, F.M. 142 (6); *Balgooy 1628* (6); *Bancroft BRI 179797* (6); *Barnett & Azzopardi 4* (7); *Basedow 117* (7); *Basedow 155* (7); *Bateman 27* (12); *Bateman LRRS 52* (7); *Bateman s.n.*, 8.5.1954 (12); *Beard 4296* (7); *Beens 6* (7); *Beens B3* (12); *Beens & Spence B 13* (12); *Beens & Spence B 29* (7); *Beesley & Ollerenshaw 955A* (4); *Bennet 1748* (7); *Benson 578, 619* (13); *Benson 975* (12); *Blake 15094* (6); *Boyland & Gillieatt 637* (6); *Brass 420* (9); *Brass 2240* (6); *Brass 5806, 8358, 8602* (13); *Brass 18901* (5); *Brass 19140* (13); *Brass 19167, 19364, 19416* (9); *Brass 19519* (6); *Brass 19591* (9); *Brass 20202, 33545* (6); *Brooker 3237* (10); *Brown, R. s.n.*, 20.2.1803 (10); *Burbidge 5746* (7); *Burvill 7438* (7); *Byrnes 11* (7); *Byrnes 312* (7); *Byrnes 500, 541* (12); *Byrnes 1656* (10); *Byrnes 1943* (12); *Byrnes 1953* (9).

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Jackson 862 (7); *Jackson NGF 2740* (13); *Jacobs 1889* (7); *Johnson 8148* (12); *Jones 680* (8); *Jones 787, 2841* (6).

Kajewski 1046 (8); *Kenneally 2148* (10); *Kenneally 2164, 4152, 4190, 4791* (7); *Kenneally 7043* (12); *Kenneally 8880, 8914* (7); *Kenneally 8966* (9); *Kenneally 8967* (7).

Ladbrook & Michael 143 (6); *Latz 79* (7); *Latz 3474* (10); *Lavarack 2087* (6); *Lazarides 6690, 6698, 6967* (7); *Lazarides & Adams 168* (10); *Levitt s.n.*, 10.3.1973 (9); *Lewis 32* (12); *Loch AQ 101775, AQ 105094, AQ 111462* (4); *Loch s.n.*, 11.1971 (5); *Luya BRI 25882* (4).

Maconochie 126, 1253 (7); *Martensz AE 116* (7); *Martensz AE 127* (10); *Martensz AE 165, 295* (7); *Martensz AE 533* (12); *Martensz AE 670* (7); *Martensz & Schodde AE 360* (10); *Martensz & Schodde AE 369, 445, 446, 452, 501, 505* (7); *McGillivray 506* (4); *McKean B20* (7); *McKean s.n.*, 15.4.1972 (12); *Michael 455* (6); *Morawetz, Waha & Weber 16–12185* (2); *Moriarty 133* (4); *Morton 1512* (1); *Mueller MEL 63368, MEL 63369* (7).

O'Mara 742 (4); *Olsen 2656* (12); *Olsen 2703* (10).

Paijmans 205, 1514 (13); *Parker 315* (7); *Pedley 2737* (5); *Perry 1946, 2614, 2783, 2987, 3017* (7); *Petrie 7* (6); *Poland BRI 36326, BRI 36327* (3); *Pullen 7198* (13).

Randall 1 (4); *Richards 59* (7); *Ridley 121* (7); *Ridsdale NGF 33564* (13); *Risley 592* (8); *Risley 6* (6); *Robinson s.n.*, 23.6.1964 (7); *Robinson s.n.*, 4.2.1964 (7).

Sanderson 185 (8); *Sanderson 764* (6); *Sankowsky 570* (8); *Sankowsky 574* (2); *Schodde 4116* (6); *Shodde AE 10* (12); *Schodde AE 24, 69* (7); *Smith, L. 3711a* (8); *Smith, L. 4745, 5001* (6); *Smith, L. 10143* (8); *Smith, L. 11871, 11920* (6); *Smith, L. 12018, 12684* (13); *Specht 1114* (7); *Specht 1244* (12); *Specht 1263* (7); *Spencer s.n.*, 7.1911 (10); *St. John 24263* (7); *Stocker 643* (6); *Stocker 657* (8); *Stocker 787* (6); *Stocker 937* (13); *Stokes 27* (7); *Story 7691, 7736, 8185* (7); *Symon 10223* (7).

Tracey 14222, 14786, 14841 (9); *Tracey 14845* (6).

Vessey 154 (6).

Webb 1624 (4); *Webb 3119* (6); *Webb & Tracey 6047* (13); *Webb & Tracey 9093, 9603, 9629* (6); *Webb & Tracey 12480A, 12725* (7); *Webb & Tracey 13146* (10); *Webb & Tracey 13194* (7); *Webb & Tracey 13823* (1); *Wheelwright 22* (7); *White & Francis BRI 179789* (4); *White & Francis BRI 181794* (4); *Williams, K. 82024* (9); *Wilson UNSW 2825, 3718* (6); *Wilson UNSW 3731* (8); *Wilson UNSW 3736* (6); *Wilson UNSW 4011, 4012* (7); *Wilson UNSW 4083, 4098* (12); *Wilson UNSW 4198* (7); *Wilson & Waterhouse UNSW 2622B* (6); *Wilson & Waterhouse UNSW 2724, 2734, 2735* (5); *Wilson & Waterhouse UNSW 2736, 2743, 2745* (13); *Wilson & Waterhouse UNSW 2767* (6); *Wilson & Waterhouse UNSW 2782* (13); *Wilson & Waterhouse UNSW 2788* (6); *Wilson & Waterhouse UNSW 2789* (9); *Wilson & Waterhouse UNSW 2799* (13); *Wilson & Waterhouse UNSW 2821* (6); *Wilson & Waterhouse UNSW 4006* (12); *Wilson & Waterhouse UNSW 4015, 4020* (7); *Wilson & Waterhouse UNSW 4036* (12); *Wilson & Waterhouse UNSW 4046* (7); *Wilson & Waterhouse UNSW 4052, 4055* (12); *Wilson & Waterhouse UNSW 4066* (7); *Wilson & Waterhouse UNSW 4075* (10); *Wilson & Waterhouse UNSW 4089* (12); *Wilson & Waterhouse UNSW 4093, 4094* (10); *Wilson & Waterhouse UNSW 4100/1, 4178, 4179, 4193* (7); *Wilson, B. QRS 69599* (5); *Wilson, I.B. 220* (7); *Wilson, Paul 10682, 10916, 11430* (7); *Winters s.n.*, 8.1913 (7); *Wrigley & Telford NQ 1487* (9); *Wynn 61* (7).

Young BRI 25311 (1).

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Nomenclatural notes, new taxa and the systematic arrangement in the genus *Scaevola* (Goodeniaceae) including synonyms

Roger Carolin

Abstract

Carolin, Roger (John Ray Herbarium, University of Sydney, Australia 2006) 1990. Nomenclatural notes, new taxa and the systematic arrangement in the genus Scaevola *(Goodeniaceae) including synonyms. Telopea 3(4):477–515.* A cladistic analysis of the species of *Scaevola* has resulted in a rearrangement of the subgeneric taxa defined by Bentham (1868) and Krause (1912). Some of the previously recognised subgeneric divisions are shown to be unnatural and some are discarded. Sect. *Crossotoma* is united with sect. *Scaevola* (sect. *Sarcocarpa*); sect. *Xerocarpa* is redefined to include sect. *Pogonanthera* which is reduced to a subsection and from which a new subsection is separated, subsect. *Parvifoliae*. *Nigrommia* is reduced to a synonym of *Scaevola*. Fourteen new taxa are described: *S. acacioides*, *S. browniana*, *S. browniana* subsp. *grandior*, *S. chrysopogon*, *S. densifolia*, *S. eneabba*, *S. glutinosa*, *S. parvifolia* subsp. *acuminata*, *S. parvifolia* subsp. *pilbarae*, *S. pulchella*, *S. revoluta* var. *viscida*, *S. spicigera*, *S. tennifolia*, *S. virgata*; three new combinations are made: *S. revoluta* subsp. *stenostachya*, *S. globosa* and *S. linearis* subsp. *confertifolia*.

Introduction

A previous contribution in this series of precursors to the Goodeniaceae treatment in the Flora of Australia has dealt with the classification and nomenclatural problems in the genus *Dampiera* (Rajput & Carolin 1988). A similar treatment of the genus *Scaevola* is now provided.

Scaevola is the only genus of Goodeniaceae which has a significant number of species endemic outside the continent of Australia. Most species are endemic to Australia but two are widespread tropical strand species and occur in the Indopacific area (*S. frutescens*) and in the Atlantic and south-west Indian Oceans (*S. plumieri*). In addition a number of species occur throughout the Pacific Islands, often in montane situations, particularly in New Caledonia and the Hawaiian group, one species is restricted to Socotra Island in the Indian Ocean and another to Hainan Island in China.

This contribution is divided into two sections. The phylogeny and systematic results are considered first since the characters used to distinguish between species in the descriptions are discussed in detail in relation to the cladistic analysis. The second section contains the descriptions of new taxa, nomenclatural notes and typifications.

Bentham (1868) and Krause (1912) provided subgeneric classifications closely resembling each other. Reassessments of these are now needed.

As in the previous contribution, a phylogenetic classification is attempted using cladistic techniques.

Phylogeny and classification

It is necessary first to consider the circumscription of the genus *Scaevola*. Carolin (1959) suggested that *S. helmsii, S. stenophylla,* and *S. fasciculata* should be excluded from *Scaevola*. There are clear characters which indicate a close relationship between these species and *Goodenia* sect. *Monochila*. These are: (i) the fusion of the sepals only by their midline to the ovary and, moreover, not to the top; (ii) the compressed seeds; (iii) the white corolla with purplish spots at the base of the lobes; (iv) the long stiff hairs in the throat of the corolla (similar, in fact, to those of *Coopernookia*) which are not inserted on barbulae or lacinations of the wing; and (v) the stiff patent hairs on the style. For these reasons these three species are excluded from this analysis. Previously they have been included in *Scaevola* because of their indehiscent fruits. This single character definition is clearly not satisfactory. When I described the genus *Nigromnia* (Carolin 1974), I suggested that it was closely related to some *Scaevola* species. I have included it in this analysis to test its distinctness.

The terminal taxa used in this analysis are listed in Appendix 1, together with their constituents. When these terminal taxa contain more than one species the constituent species do not differ in any of the characters used in the analysis.

The characters used in the analysis are listed and discussed below. Multistate coding is used where the transformation series is considered to be linear. When it is considered to be branched, additive coding is used.

The polarity of the character states is determined largely by outgroup comparison. Carolin (1977) has provided a higher order cladogram which indicates the outgroups to be *Nigromnia, Diaspasis* and *Coopernookia. Nigromnia* is probably a derivative of one of the groups within *Scaevola* (see below) and is therefore not an outgroup for the whole genus. *Diaspasis* has many specialized features which make it necessary to refer to *Coopernookia* to obtain the most parsimonious interpretations of polarities. In some cases it is necessary to refer to the outgroups of the clade containing *Coopernookia* to determine the most parsimonious polarisation. Where the outgroups are unequivocal in determining polarities no further comment is provided. The asterisk (*) indicates the primitive condition. The numbering of the characters is that given in the figures and a summary of the characters is given in Appendix 2.

1. Shrubs (and climbers): 0; undershrubs: 1*; multicaulate from a stock: 2.

2. Young parts not viscid: 0*; young parts viscid: 1.

When the young parts are viscid the older parts are often covered with a varnish which eventually cracks and fragments. The varnish is secreted by glandular hairs which are either peltate or pseudostellate (see below), although some species which have glandular hairs with globular heads are viscid without producing a varnish (e.g. *S. glutinosa*). The outgroups appear to be equivocal with regard to this character. *Diaspasis* is not viscid whereas one species of *Coopernookia, C. polygalacea,* is. However, this is only one species and, since the outgroup of the clade containing *Coopernookia* and *Scaevola* has no viscid species, the most parsimonious interpretation is that the lack of this character is primitive.

3. Stems not ribbed: 0*; stems ribbed: 1.

4. Cauline leaves normally developed: 0*; cauline leaves mostly reduced to triangular 'scales' less than 5 mm long: 1.

5. Leaves not stem-clasping at the base: 0*; leaves stem-clasping at the base: 1.

Some species have clearly petiolate leaves, e.g. *S. crassifolia*, and others are just as clearly sessile, e.g. *S. linearis*. However, the gradations between these extremes are so gradual over the genus that it is impossible to draw a rational boundary between the two states. I have therefore not used this feature in this analysis. There is, however, a clear difference between stem-clasping and not stem-clasping.

6. Simple hairs present: 0*; simple hairs absent: 1.

These hairs generally differ from those found elsewhere in the family since they are papillate (Carolin 1970).

7 and 8. Glandular hairs absent: 00; glandular hairs with globular heads: 01*; glandular hairs peltate: 02; glandular hairs pseudostellate: 11. (See Fig. 1).

Carolin (1977) has suggested a transformation series for these hair types. It is suggested that the globular head type has given rise to the peltate type by shortening of the stalk and broadening of the head into a shield shape. The pseudostellate type, now seen to be much more widespread in the genus than previously reported (Carolin 1970), also developed from the globular head type by an extension of each of the cells in the head. Sometimes the stalk of the pseudostellate type is also reduced. All these hair types are known to secrete substances in some species although in others they may be inactive in this respect (Carolin, pers. obs.). The viscid nature of the plant is probably a

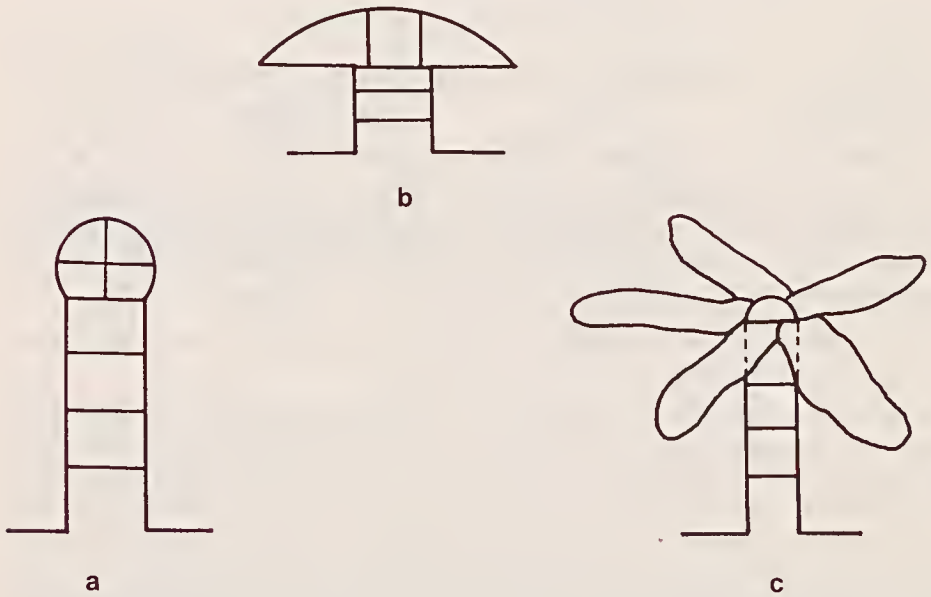

Fig. 1. Types of glandular hair (coding for characters 7 and 8 given in parentheses). [glandular hairs absent (00)]; a glandular hairs with globular heads (01); b glandular hairs peltate (02); c glandular hairs pseudostellate (11).

function of the amount secreted and possibly of the type of secretion. The pseudostellate glandular hairs of some species, e.g. *S. spinescens* and *S. coriacea*, do not appear to secrete at all and remain simply as a scurfy indumentum.

9. Compound thyrse: 0; thyrse reducing to a raceme or spike above: 1*; raceme or spike: 2.

10. Infloresence mostly terminal: 0*; inflorescence mostly axillary: 1.

In those species with mostly lateral inflorescences the main stem produces a large number of more or less condensed inflorescences in the leaf axils. The terminal bud may or may not eventually produce one itself.

11. Bracts all more or less the same size as leaves: 0; bracts reducing in size towards the apex: 1*; bracts mostly reduced: 2.

This is a difficult character to score but it appears to be so useful in defining groups that it is included despite the need to make some relatively arbitrary decisions.

12. Bracts without marginal bristles: 0*; bracts with marginal bristles: 1.

13. Bracteoles similar to leaves but smaller: 0*; bracteoles much smaller than leaves, ± lanceolate: 1; bracteoles minute: 2.

14. Flowers pedunculate: 0*; peduncles obsolete: 1.

The pedicel is the flower stalk above the bracteoles, the peduncle is the stalk below the bracteoles. See character 29 below.

15. Sepals >1.5 mm long: 0*; sepals ≤ to 1.5 mm long: 1.

16. Sepals free: 0*; sepals connate with distinct lobes: 1; sepals connate into an undulate rim: 2.

17. Corolla not bearded inside: 0*; corolla bearded inside: 1.

The beard of the corolla refers to dense long hairs in the throat as opposed to a thin scattering of hairs or their absence. Generally there is a clear discontinuity between the two states. (Striations on the wings of the corolla lobes are an autapomorphy for the terminal taxon STRI.)

18. Barbulae broad (mostly 0.2 mm wide or more), flat: 0*; barbulae narrow (less than 0.2 mm wide), ± terete: 1. (See Fig. 2.)

The barbulae occur on the margins of the corolla wings towards the base of the lobes and/or as outgrowths in the throat. They would appear to be analogues, but possibly not homologues, of the 'calli' in *Dampiera* (Rajput & Carolin 1988) and the 'enations' of *Goodenia* (Carolin, unpub). In *Coopernookia* and *Goodenia* sect. *Monochila*, there are long stiff hairs in these positions. In some species of *Scaevola*, e.g. *S. sericea*, these long stiff hairs occur at the ends of the lacinations of the corolla wings and on the ends of broad outgrowths from the throat which have the same texture as the wings. Thus it is the terminal hairs of the barbulae of *Scaevola* which are homologous with the stiff hairs inside the corolla of *Coopernookia* and *Goodenia* sect. *Monochila*. The body of the barbula, in *Scaevola*, is an extension of the margin of the wing. In many species the stiff terminal hairs of the barbulae are reduced to papillae, e.g. *S. linearis*,

whilst in others they may be obsolete, e.g. *S. sericophylla.*

19. Stiff hairs in place of barbulae: 0*; barbulae aculeate with stiff hairs: 1; barbulae papillate at top: 2; barbulae simple: 3; barbulae absent: 4. (See Fig. 2.)

The lacinations on the margins of most species of sect. *Scaevola* are considered to be homologous with the narrower barbulae of most other species and are here referred to as 'barbulae'.

20. Apex of anther glabrous: 0*; apex of anther hairy: 1.

21. Hairs present on lips of indusium: 0*; hairs absent from lips of indusium: 1.

22, 23 and 24. Indusium with hairs scattered over the upper surface: 000*; indusium with a few basal hairs on the upper surface: 010; indusium glabrous on the upper surface: 020; indusium with a stiff erect beard at the base on the upper surface, equalling or exceeding the lips: 100; indusium with a short flat beard at the base on the upper surface: 200; indusium with short flat dense beard on the upper surface: 101. (See Fig. 3.)

25. Mesocarp dry: 0*; mesocarp fleshy: 1.

26. Fruit with four fertile locules: 0*; fruit with two fertile and two sterile locules: 1; fruit with two fertile locules only: 2; fruit with only one fertile locule: 3.

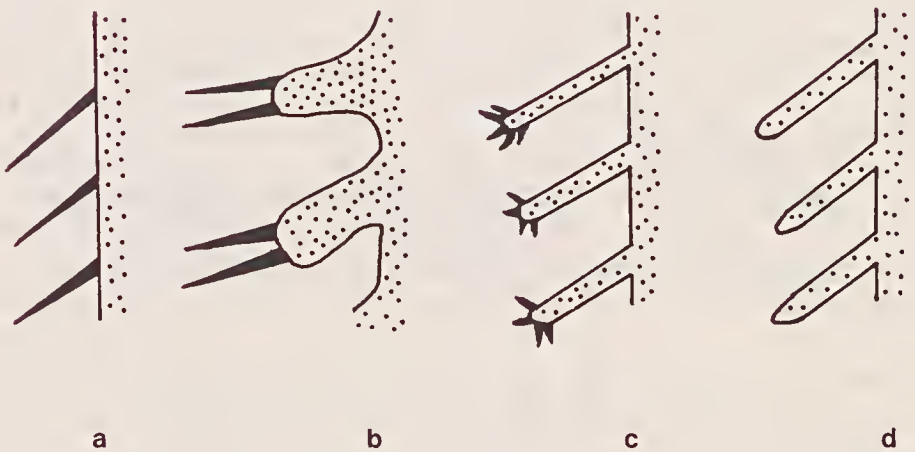

Fig. 2. Barbulae type and position on the margins of the wings or their extensions which are decurrent in the throat of the corolla (coding for characters 18 and 19 given in parentheses). a No barbulae, hairs on ± straight margin (00); b Barbulae broad (laciniations), aculeate with long stiff hairs (01); c Barbulae narrow, papillate (the hairs reduced to papillae) (12); d Barbulae narrow, simple (13). The stippled area represents the multicellular petal tissue; the unicellular hairs are shown in black.

Carolin (1966) has described the characteristics of the fruit of the genus. Despite the outgroups only having two (or one) locules in the fruit, the floral anatomy (see also Carolin 1959) indicates that the primitive condition is four-carpellary and, therefore, in all probability four-locular. This is accepted as a basis for the analysis.

27. Endocarp smooth: 0*; endocarp rugose: 1.

28. Fruit glabrous: 0*; fruit hairy: 1.

The indumentum condition of the fruit is not necessarily the same as the rest of the plant and is treated as a separate character.

29. Flower pedicillate: 0*; Flower sessile in bracteoles: 1.

See character 14 above. This character was only used in the analysis of group B and therefore was not recorded for species included in the cladograms of group A.

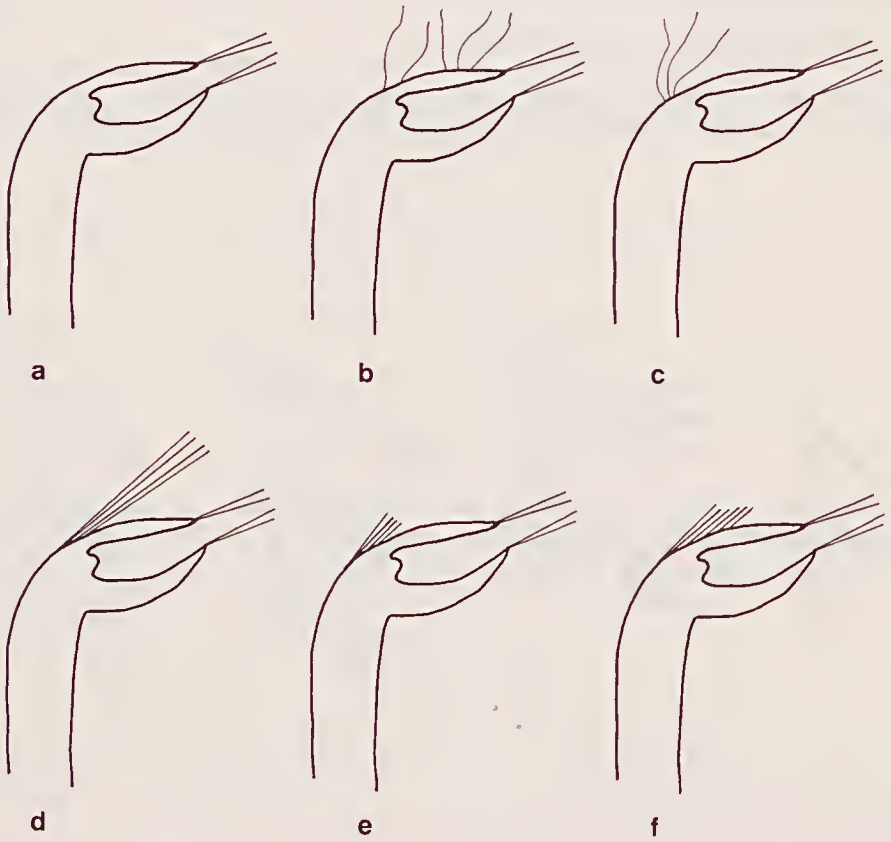

Fig. 3. Arrangement of the hairs on the upper surface of the indusium (coding of characters 22, 23, 24 given in parentheses). a Indusium glabrous (020); b Indusium with hairs scattered over the surface (000); c Indusium with a few basal hairs (010); d Indusium with a beard of long stiff hairs at the base mostly equalling or exceeding the lips (100); e Indusium with a short flat beard at the base (200); f Indusium with a short flat dense beard at the base (101).

The cladograms

The preliminary cladograms were generated by Swofford's PAUP package using global branch swapping and the MULPARS option (Swofford 1986) and an outgroup as defined by the primitive states of the characters (see above). One hundred trees with overall parsimony, and a strict consensus tree, were generated by the algorithm although many of these were in principal the same (see Swofford 1986). The strict consensus tree was then used as input to MACLADE (Maddison and Maddison 1987) and manipulated to test the effect of moving specific clades.

When there is a great deal of homoplasy in a cladogram, there are almost always a number of alternative most parsimonious trees. The consensus tree is, then, usually much longer than those from which it is derived. Nevertheless, each of these latter is a possible phylogeny; that there are several most parsimonious trees indicates that the raw information will not resolve the phylogeny. There seems little point in showing any of these trees as we did for *Dampiera* (Rajput and Carolin 1988), since none of them are more preferred than the others. There may be ways of resolving such situations by weighting the less homoplasious characters but this is time-consuming without the necessary computer programs and it still may not produce a resolution. Moreover, giving an arbitrary weighting to a character at the start of an analysis, applies this weighting throughout the group under consideration. When one is dealing with a large group this may not be appropriate, since a character may be more variable on one clade than on another. Gauld and Underwood (1986) have addressed this problem to some extent but their technique is not incorporated into the more generally available packages. By scanning the series of most parsimonious trees, it is possible to select clades which are 'robust', i.e., occur in a large number of such trees. However, since most parsimonious solutions are N-complete, it may not be possible to assign probabilities to any particular clade and therefore one has no satisfactory measure of confidence except intuition. Even considering only the trees generated in this run, there are no resolutions of the polychotomies of the consensus tree which one could accept as being significantly more frequent. The most appropriate way of dealing with this problem available at present seems to be by using MACLADE which enables clades to be manipulated individually to achieve a resolution based upon what one believes to be 'robust' characters.

The preliminary analysis was completed using all terminal taxa. Since there was a clear division into two main groups, however, the results are reported in two separate parts.

Three cladograms are figured. The first (Fig. 4) is the consensus cladogram generated by PAUP for all sections other than sect. *Scaevola*.

The second (Fig. 5) is the consensus cladogram for sect. *Scaevola* in which an extra character, number 29, has been included.

The third (Fig. 6) is the preferred cladogram established by manipulation with MACLADE. In this I have given weight to the type of beard on the back of the indusium. Those species on the sub-sect. *Xerocarpa* clade which have a long beard I have grouped together on the same clade and those with the beard reduced to short appressed bristles I have grouped on another clade, reducing the tree length by 4 character state changes. No such manipulation was considered necessary in sect. *Scaevola*.

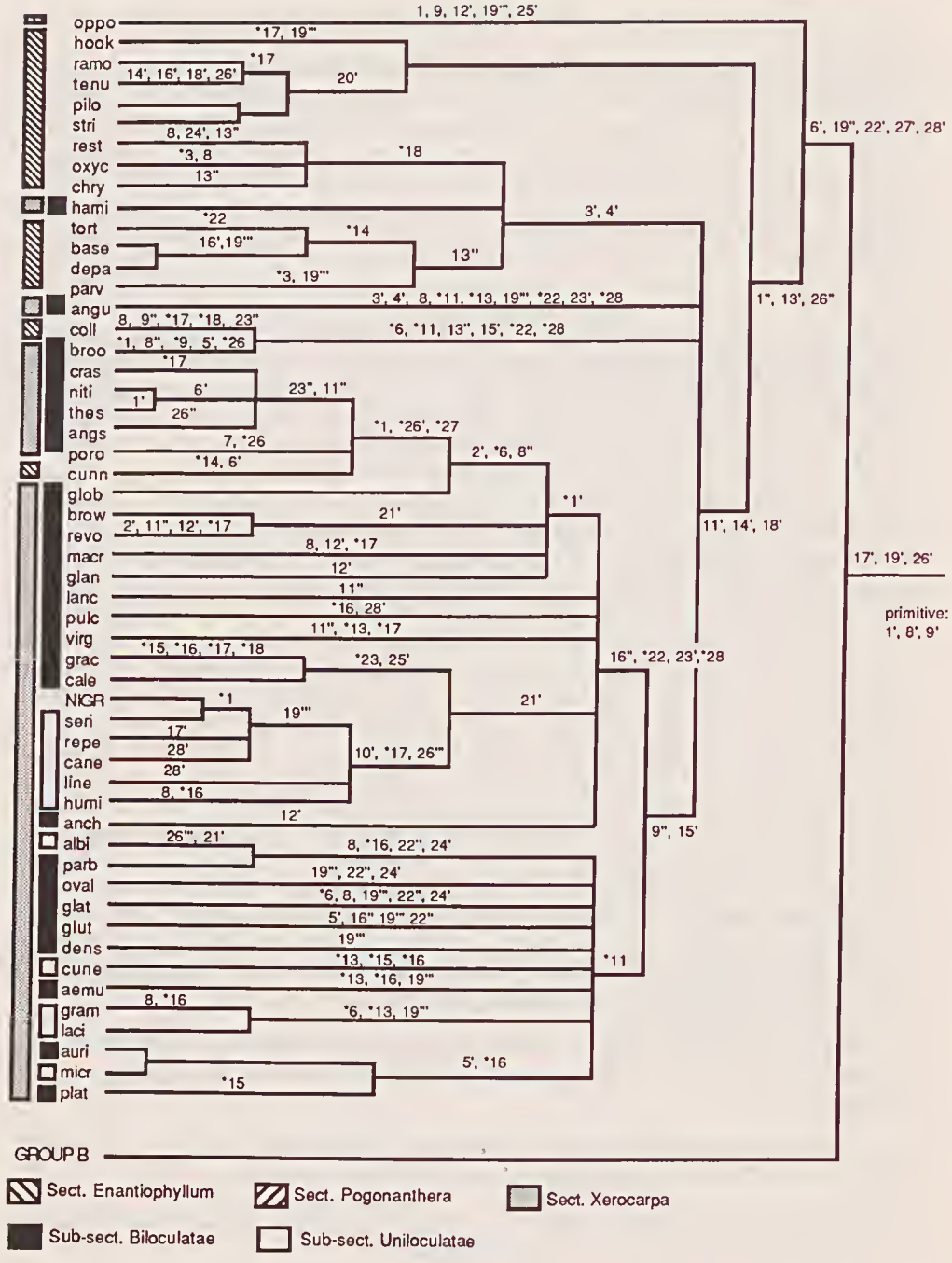

Fig. 4. The consensus cladogram for Group A. The key to the abbreviations of the names of the terminal taxa is provided in Appendix 1. The key to the character codes is provided in Appendix 2. The attachment of Group B (sect. *Sarcocarpa*, Fig. 5) is shown. A number without a prime represents a change of a binary character from state '0' to state '1'; a primed number indicates a change of a multistate character to the state indicated by the number of primes; an asterisked number represents a reversal of a character to the state indicated by the prime.

I have also indicated a possibly paraphyletic group of species which it may be useful to examine in the future. The frequently purple beard on the back of the indusium is possibly an advanced feature which unites them, although it is not consistent in some of the species. In addition *S. oxyclona* has the same purple beard.

Discussion

The first point to draw attention to is that three changes occur at the root of the cladogram, which may well indicate that the arguments used to polarize these character states are giving incorrect solutions.

The primitive character state of the barbulae (character 19) is, as mentioned above, not present in *Scaevola* and that has to change. The bearded throat of the corolla also appears to be primitive. The cladogram also suggests that a fruit with two sterile locules is primitive.

S. porocarya is the only member of the family which has four fertile locules. I have suggested (Carolin 1966) that this corroborates my interpretation of the 4-carpellary nature of the ovary of Goodeniaceae and is thus the primitive condition. The cladogram indicates that *S. porocarya* is not a primitive species and, indeed, that the state of four fertile locules is derived from the state of two fertile locules. Elsewhere (Carolin 1987) I have argued that large scale morphological reversions like this are unlikely to occur. It is difficult to do that here in view of the number of other advanced characters of the species in question. Moreover, if this reversion is disallowed the cladogram would show seven

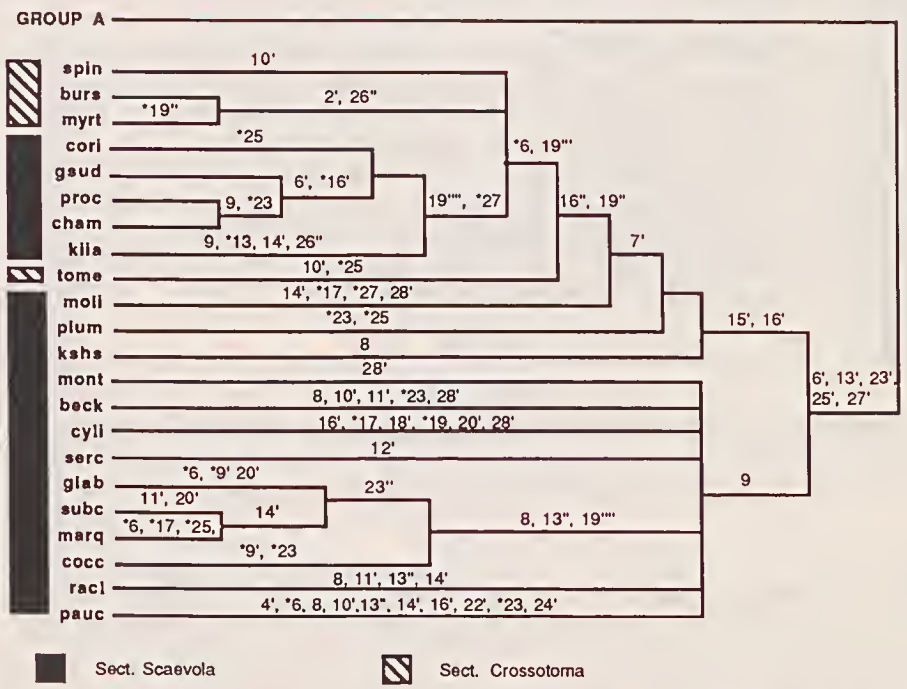

Fig. 5. Consensus cladogram of Group B. See Fig. 4 for explanation. Group A attachment is indicated. The whole of this group is referred to sect. *Scaevola* (*Sarcocarpa*) in this contribution.

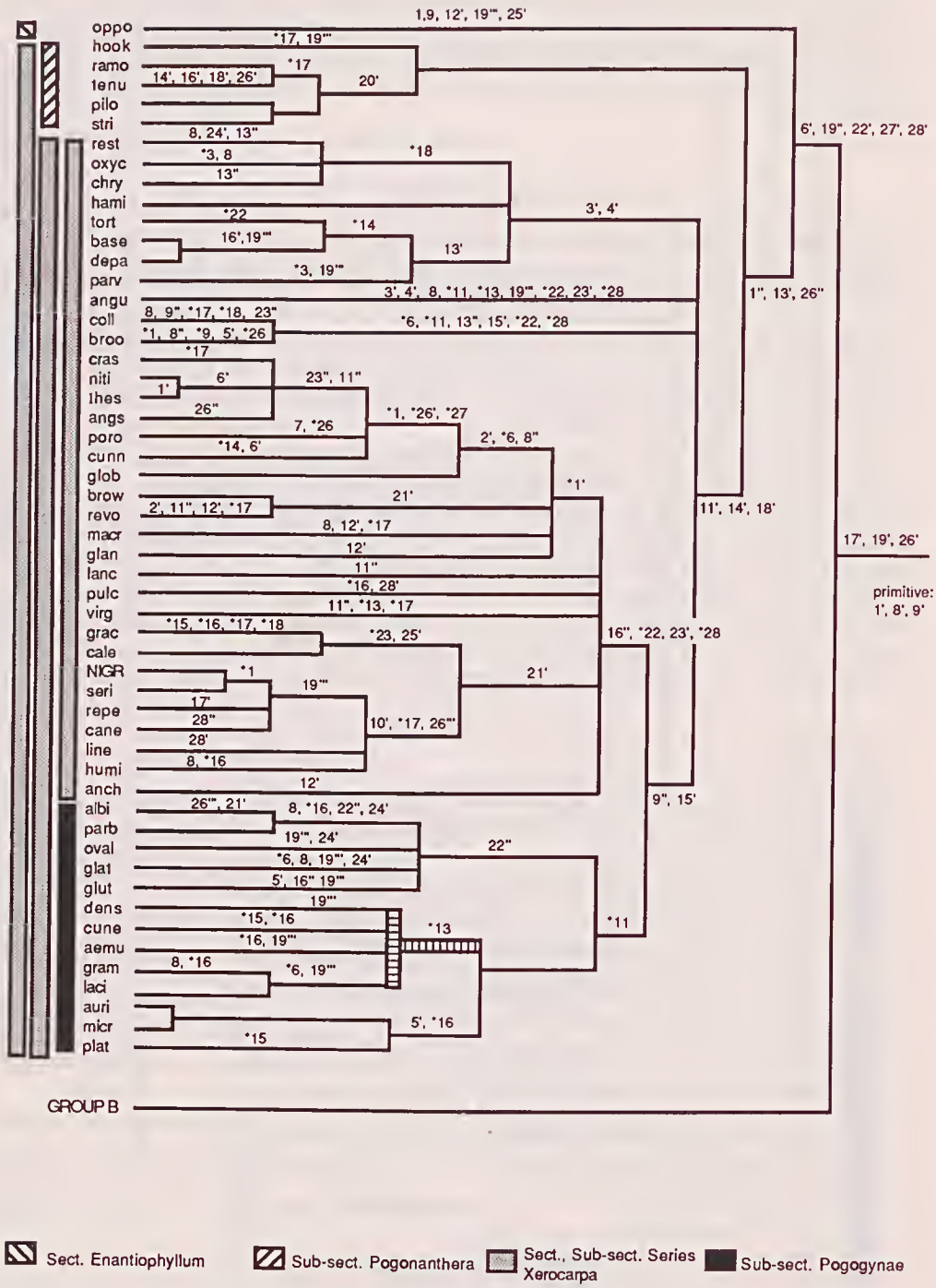

Fig. 6. Preferred cladogram of Group A. See Fig. 4 for explanation. The clade including DENS, CUNE, AEM and GRAM-LACI represents a possibly paraphyletic group discussed in the text.

independent origins of the 2-locular condition. The problem of such apparently complex reversions needs addressing carefully but, despite this result, I am not convinced that overall parsimony is necessarily the answer.

The primitive state of characters number 1, 8 and 9 is set to '1'.

Also of interest is the change of state in the hairs on the back of the indusium at the base of Group A (sects. *Xerocarpa* and *Enantiophyllum*) to a long stiff beard (character 22). This suggests that the state 'Indusium with a few basal hairs' (character 23), which characterizes a number of clades above the first branching, is a reduction transformation of the long stiff beard and not of scattered hairs as the additive coding of character 22 and 23 implies. Changing the coding to allow for this new interpretation does not result in significant changes to the cladogram which is generated.

Some comment about *Nigromnia* is necessary at this stage. All the characters which I discussed when erecting *Nigromnia* are clearly autapomorphies for it; one of them, the dense axillary clustering of the flowers, is simply an extreme case of axillary spikes with numerous flowers. Although the general appearence of *N. globosa* is considerably different from other members of this group, there is little doubt about its position amongst those species with axillary spikes. However, I do not consider that the differences are great enough to warrant maintaining it as a separate genus and thus making *Scaevola* paraphyletic.

An examination of the clades in the preferred cladogram shows that mostly they are reasonably well founded. The position of the clade constituting *S. collaris* and *S. brookeana* is probably open to question since it is quite widely dispersed in the preliminary most parsimonious cladograms. *S. angulata* is also quite widely dispersed by the preliminary cladograms; it occurs in several positions in subsect. *Xerocarpa* and in several positions in subsect. *Parvifoliae*. Its position therefore remains doubtful. On the other hand there are some fairly well established clades within sect. *Xerocarpa*, e.g., the one rooted below *S. globulifera* with peltate hairs secreting varnish and few simple hairs (or none). *S. gracilis* and *S. calendulacea* (together with *S. porrecta*) also represent a well defined clade. All these species have fleshy fruits, like those of sect. *Scaevola*, and are strand plants or plants of coastal sand-dunes, probably dispersed to the outlying parts of the distribution of the clade by sea birds which presumably eat the mesocarp. The clade rooted below *S. humifusa*, characterized by the synapomorphy of lateral inflorescences, is also well defined.

Taxonomy

The sections as defined by Bentham (1868) and Krause (1912) do not appear to be natural groupings. They are discussed below in relation to the cladograms. The systematic arrangement suggested by the present study is presented at the end of this discussion.

Sect. *Sarcocarpa*

Bentham (1868) included only one species in this section for Australia. Bentham and Hooker (1876) and Krause (1912), dealing with the genus on a world-wide basis, each describe the section in much the same way. It is, in fact, better represented outside Australia than in it. The cladogram indicates that at least part of the section is related to sect. *Crossotoma* as circumscribed by Bentham (1868) and Krause (1912) with subsequent additions. This is primarily due to the peculiar pseudostellate hairs (see above) and the fleshy fruit. The

cladogram clearly indicates that some of the Hawaiian species are more closely allied to sect. *Crossotoma* than any of these are to some other Hawaiian species or to any of the New Caledonian species — a rather unexpected result. It also indicates that *S. coccinea*, from New Caledonia, is more closely related to *S. glabra*, from Hawaii, and to the Marquesan species, *S. capitata* and *S. marquesensis*, than it is to the other New Caledonian species. The first, two in particular, show a close relationship in the unique combination of a long pedicel with an obsolete peduncle (see characters 14 and 29), resulting in the bracteoles being inserted in the axils. This may possibly be due to convergence as a result of the specialized bird pollination of all these species. Although there remain a number of unresolved polychotomies in the Oceanic species, the cladogram suggests at least three colonizations of the Hawaiian Islands: *S. sericea*, the *S. gaudichaudiana* group and *S. glabra* as suggested by Patterson (1987). The cladogram indicates that sect. *Crossotoma* should be included with sect. *Sarcocarpa* (sect. *Scaevola*).

Sect. ***Phacelophyllum***

Unfortunately, I could not obtain satisfactory material of the single species, *S. hainanensis*, of this section early enough to include in the analysis. Towards the end of the investigation, however, I was lent some material with a few flowers and it seems that it is closest to *S. plumieri*. It has aculeate barbulae and sepals connate into a sinuate tube. The flowers, although mostly solitary, have buds in the axils of the bracteoles indicating that they may on occasion develop into cymes. Even the peculiar swollen leaf base, which is characteristic of this species, appears almost as a development of the slightly swollen base in *S. plumieri*. It shows a superficial resemblance to *S. calendulacea* but it has large leaf-like bracts, unlike the reduced ones of *S. calendulacea*, and aculeate barbulae unlike the papillate ones of *S. calendulacea*. It has not been possible to determine the fruit type. I am here reducing this section to a synonym of sect. *Scaevola*.

Sect. ***Pogonanthera***

Bentham (1868) and Krause (1912) circumscribe this section in exactly the same way. There is no one feature which satisfactorily differentiates this section from sect. *Xerocarpa* as circumscribed by them. Their emphasis appears to be on the presence of a peduncle in the former, although this does not occur in all the species included. The cladogram indicates that *S. cunninghamii* and *S. collaris* do not belong to the same clade as the rest of this section as defined by Bentham and Krause. Although I do not consider the systematic position of *S. collaris* established clearly, it does seem to belong with sect. *Xerocarpa*. *S. cunninghamii* clearly belongs to sect. *Xerocarpa*. The composition of the rest of the section is equivocal according to the preferred cladogram. There is no clear advanced character uniting the *S. ramosissima* group with the *S. parvifolia* group, whereas there are clear synapomorphies separating them. Moreover *S. hamiltonii*, which Krause includes in sect. *Xerocarpa*, falls here into the *S. parvifolia* group. It is probably better to recognize three sub-sections here since these clades have little in common. *S. angulata* remains an unresolved clade which prevents a completely confident separation of sub-sect. *Parvifoliae* and *Xerocarpa*.

Sect. ***Xerocarpa***

This represents a fairly well founded clade, although it is necessary to exclude some of the species previously included in it and to enlarge its circumscription.

In particular, series *Parviflorae* of Bentham (1868), with subsequent additions, is referred to *Goodenia* sect. *Monochila* (see above). The other series which Bentham (1868) recognizes within sect. *Xerocarpa* do not appear to be natural groupings. The members of series *Monospermae*, which Krause (1912) raises to subsection *Uniloculatae*, and in which he includes Bentham's series *Parviflorae*, are scattered over several different clades and the series seems to be of little taxonomic significance (Fig. 4). Series *Pogogynae* is not represented by a clade on the preferred cladogram. However, I am suggesting that sub-sect. *Xerocarpa* be divided into two series, neither of them represented by well defined clades, but which may be useful in assessing the variation within the genus. Series *Pogogynae* consists of those species which have a well defined basal beard on the upper surface of the indusium. This beard may be long or short and corresponds more or less with Bentham's (1868) series *Pogogynae*. Series *Xerocarpa* consists of those species with a few basal hairs or with scattered hairs on the upper surface of the indusium. Whether either of these series is actually a clade depends entirely on the interpretation of the transformation of the indusial beard. The evidence presented here does not allow us to resolve this problem. Series *Macrostachyae* and *Globuliferae* appear to be quite polyphyletic and are therefore here reduced to synonyms.

As indicated above, the position of *S. oxyclona* is possibly not secure in sect. *Parvifoliae* since it shows resemblances to the paraphyletic series *Pogogynae*.

Sect. ***Enantiophyllum***

van Leenhouts (1957) reduced this to a single species which here stands as a separate clade.

Synopsis of sections, subsections and series of Scaevola

Sect. **Scaevola**

Sect. *Sarcocarpa* Don, Gen. Hist. 3: 727 (1834).

ORTHOGRAPHIC VARIANT: *Sarcocarpeae* DC., Prodr. 7: 508 (1839).

LECTOTYPE: *S. plumieri* (L.) Vahl, here chosen.

Sect. *Crossotoma* Don, Gen. Hist. 3: 730 (1834).

LECTOTYPE: *S. spinescens* R. Br., here chosen.

Sect. *Phacelophyllum* K. Krause, Pflanzenr. 54: 118 (1912).

HOLOTYPE: *S. hainensis* Hance.

Mostly tall shrubs, often with large leaves. Vegetative growth usually continuing on the main inflorescence axis after flowering has ceased. Bracts leaf-like. Bracteoles usually small to minute. Barbulae often aculeate. Mesocarp fleshy.

Sect. **Enantiophyllum** *Miq.*, Ann. Mus. Bot. Lugd. Bat. 1: 210 (1864).

HOLOTYPE: *S. amboinensis* Miq.

Scramblers with large opposite leaves. Vegetative growth continuing on main inflorescence axis after flowering has ceased. Bracts leaf-like. Bracteoles minute. Barbulae simple. Mesocarp fleshy.

Sect. **Xerocarpa** *Don*, Gen. Hist. 3: 728 (1834).

ORTHOGRAPHIC VARIANT: *Xerocarpeae* DC., Prodr. 7: 508 (1839).

LECTOTYPE: *S. crassifolia* Labill., here chosen.

Sect. *Gymnostegia* Benth. in Endl., Enum. Pl.: 68 (1837). (Bentham gives the name thus in the main text but in the footnote describing the section he gives '*Gymnostigma*'. It is, however, the nakedness of the indusium that is emphasised and I am here accepting the first spelling.)

TYPE: *S. thesioides* Benth.

Shrubs or herbs with a stock. Leaves various. Growth of the inflorescence axis terminating after flowering. Bracteoles various. Barbulae papillate, simple or absent. Mesocarp dry, thin.

Subsect. **Xerocarpa**

Subsect. *Biloculatae* K. Krause, Pflanzenr. 54: 145 (1912).

LECTOTYPE: *S. crassifolia* Labill., here chosen.

Subsect. *Uniloculatae* K. Krause, Pflanzenr. 54: 160 (1912).

LECTOTYPE: *S. canescens* Benth., here chosen.

Series Monospermae Benth., Fl. Austral. 4: 86 (1968).

LECTOTYPE: *S. canescens* Benth., here chosen.

Flowers mostly sessile. Leaves well developed. Anthers glabrous at tip.

Series **Xerocarpa**

Series *Globuliferae* Benth., Fl. Austral. 4: 85 (1868).

LECTOTYPE: *S. globulifera* Benth., here chosen.

Series *Macrostachyae* Benth., Fl. Austral. 4: 85 (1868).

LECTOTYPE: *S. macrostachya* Benth., here chosen.

Indusium without a definite basal beard.

Series **Pogogynae** *Benth.*, Fl. Austral. 4: 98 (1868).

LECTOTYPE: *S. aemula* R. Br., here chosen.

Indusium with a basal beard of stiff bristles which may be reduced to short appressed hairs.

Subsect. **Pogonanthera** *(Don) Carolin,* **comb. nov.**

BASIONYM: sect. *Pogonanthera* Don, Gen. Hist. 3: 729 (1834).

ORTHOGRAPHIC VARIANT: *Pogonandra* DC., Prodr. 7: 511 (1839).

LECTOTYPE: *S. striata* R. Br., here chosen.

Flowers pedunculate. Anthers with hairs at tip (except *S. hookeri*).

Subsect. **Parvifoliae** Carolin, **subsect. nov.**

HOLOTYPE: *S. parvifolia* Benth.

Flores plerumque pedunculati; folia caulina parva.

Flowers usually pedunculate. Cauline leaves usually reduced. Anthers glabrous at tip.

Scaevola sect. **Xerocarpa** series **Parviflorae** *Benth.*, Fl. Austral. 4: 86 (1868).

LECTOTYPE: *S. fasciculata* Benth., here chosen, is referred to the genus *Goodenia.*

Typifications, nomenclatural notes and new taxa

This section is dealt with in the same way as in the contribution on *Dampiera* (Rajput & Carolin 1988). Argument is provided there for the selection of various types in the cases of collections by R. Brown, L. Preiss, and E. Pritzel. The same symbols are used to designate the selection of lectotypes, i.e. when only one collection relates to the protologue this is shown by '*' after the type statement; when lectotypes have to be selected from more than one collection relating to the protologue this is shown by '#'.

When a name is considered to be a synonym of another name, the name which is currently accepted is given after ' = '.

In all cases, other things being equal, the specimen cited in the protologue which agrees most closely with the protologue description is selected. Where all agree well, the most complete specimen is selected.

When selected specimens are cited, the total number which was examined is indicated in parentheses.

The taxa are arranged in a supposedly phylogenetic sequence.

Taxa here included in *Scaevola*

Temminckia tahitensis Nadeaud, J. Bot. (Desvaux) 1897: 107 (1897) = **S. tahitensis** *Carlquist.*

LECTOTYPE: TAHITI: A 1200 mètres à la base du Mont Mauru, district de Hitiao á la seconde étape pour aller au Vaipurau, Mr Temarii, 4 Nov. 1896 (P).#

Scaevola spinescens *R. Br.,* Prodr.: 586 (1810).

LECTOTYPE: SOUTH AUSTRALIA: Near the shores of Bay no 3., Anch(orage) 5, and Bay 5, South Coast, R. Brown (BM). ISOLECTOTYPE: K.#

There is only one sheet of Brown's collections of this species at BM and it bears two labels as indicated above. 'Anch(orage) 5' is the same as 'Bay 5', 'Bay 3' is not. It is quite impossible to separate the collections and the whole sheet is accepted as the lectotype. The sheet at K is labelled 'South Coast Bay IV, V, VII, XII, XIV'. In this case also it is impossible to separate the collections.

Scaevola acacioides *Carolin,* **sp. nov.**

Frutex ad 1 m altus pilis furfuraceis. Folia angustc oblongo-elliptica 25–50 mm longa crassa glabrescentes. Flores plerumque in dichasiis vel monochasiis dispositi, sessiles inter bracteolas. Corolla alba vel cremea ad 13 mm longa.

HOLOTYPE: WESTERN AUSTRALIA: Bee Gorge, lat: 22°16′ S: 118°15′ E, Wittenoom area, *Blockley 21–9,* 30 May 1966 (PERTH).

Shrub to 1 m high with scurfy hairs on the younger parts. *Leaves* thick, greyish green, narrow-oblong-elliptic, 25–50 mm long, 2–5 mm wide, tapering gradually towards base, glabrescent, with a few villous axillary hairs, acute, entire. *Flowers* in dichasia or monochasia or solitary in leaf axils, sessile between the bracteoles; peduncle 8–15 mm long; bracteoles deltoid, 1–1.5 mm long. *Sepals* connate into a sinuate rim c. 0.5 mm high. *Corolla* white to cream, 10–13 mm long, with some scurfy stellate-glandular hairs outside, with a dense beard of white hairs on connate part of lobes; barbulae prominent, papillate terminally; connate part of lobes 7–8 mm long; lobes equal, 5–6 mm long, 1.5 mm wide;

wing obsolete or very narrow. *Stamen* filaments filiform, c. 8 mm long; anthers oblong, 2 mm long, obtuse. *Ovary* 2-locular almost to summit, with a few scurfy hairs; style slightly curved, 7 mm long with a few simple hairs towards base; indusium transverse-obovate, 0.5 mm long, 1.5 mm wide, with a few white hairs above and white bristles c. 0.3 mm long on lips. *Fruit* not seen.

RANGE: Pilbara region of Western Australia.

HABITAT: Ironstone soils.

DISCUSSION: The longer leaves and the branched inflorescence distinguish this from other Australian species in sect. *Scaevola.*

SPECIMEN EXAMINED: WESTERN AUSTRALIA: 38 km W of Wittenoom, *K. Newbey 10051* (PERTH).

Named for the superficial similarity of the leaves to the phyllodes of some *Acacia* sp.

Scaevola bursariifolia *J. Black*, Trans. & Proc. Roy. Soc. S. Australia. 51: 385 (1927).

LECTOTYPE: SOUTH AUSTRALIA: Bunda Plateau (north of Fowler's Bay towards Eucla), *R. Tate*, Feb. 1879 (AD).#

Scaevola groeneri F. Muell., Fragm. 6: 15 (1866) = **S. myrtifolia** *(Vriese) K. Krause.*

LECTOTYPE: WESTERN AUSTRALIA: *Drummond 363* (MEL). ISOLECTOTYPES: BM, K, W.#

Merkusia myrtifolia Vriese, Natuurk. Verh. Maatsch. Wetensch. Haarlem ser. 2 10:72 (1854) = **S. myrtifolia** *(Vriese) K. Krause.*

HOLOTYPE: WESTERN AUSTRALIA: S.W. Australia, *Drummond 363* (K).

ISOTYPES: BM, P. Vriese gives 'Drummond 263', but this is apparently a misprint for 363.

Scaevola tenuifolia *Carolin,* **sp. nov.**

Herba prostrata pilis brevibus patentibus obtecta. Folia linearia plerumque integra. Cymae axillares pedunculis arcuatis. Alae petalorum non striatae. Antherae comosae manifeste. Barbulae corollae brevissimae vel obsoletae.

HOLOTYPE: WESTERN AUSTRALIA: Foot of East Mount Barren, *Blackall 1417*, 26 Sept. 1931 (PERTH).

Decumbent to prostrate perennial herb to 1 m. *Stems* ± striate, mostly branching from the base, hispid with short patent simple and small red glandular hairs. Leaves sessile, linear, mostly entire, revolute; basal leaves 2–4.5 cm long, 0.2–0.4 cm wide, occasionally to 4-toothed towards apex; cauline leaves 0.7–3.5 cm long, 0.1–0.2 cm wide. *Flowers* in racemes or simple thyrses; peduncles curved, slender, 1–5 cm long; bracteoles linear-triangular, 2–8 mm long, entire. Sepals free, linear, c. 2 mm long. *Corolla* 12–20 mm long, blue to mauve; lobes apiculate, 7–10 mm long, 1.5 mm wide, with long patent simple white hairs outside, densely bearded inside; barbulae simple or almost obsolete; wings 4–6 mm long, 2 mm wide, not striate. *Stamen* filaments 2–4 mm long; anthers oblong, 1 mm long, apiculate and comose. Ovary oblong, c. 2 mm long, hairy as on sepals with denser glandular hairs; style 5–8 mm long; indusium c. 1 mm long, 2 mm wide, densely covered with white simple hairs and with dense marginal bristles c. 0.2 mm long. *Fruit* ribbed, 2-locular.

RANGE: South western Australia; only known from East Mount Barren and Thumbs Peak.

DISCUSSION: This species is related to *S. striata* from which it can be distinguished by the stiff patent hairs on the stems, the curved peduncles and the wings of the petals which are not striate.

SELECTED SPECIMENS EXAMINED (7): WESTERN AUSTRALIA: Top of Mt Barren, *Gardner & Blackall*, s. dat. (PERTH); SW to E slopes of East Mt Barren, *Willis*, 14 Oct. 1961 (PERTH); East Mt Barren, *George 3672*, 21 April 1962 (PERTH); Thumbs Peak Range, *George 7117*, 31 Oct. 1965 (PERTH).

Named for the narrow leaves. Latin, *tenuis-* = narrow; *-folium* = leaved.

Scaevola apterantha F. Muell., Fragm. 1: 121 (1859) = **S. ramosissima** *(Sm.) K. Krause.*

LECTOTYPE: VICTORIA OR NEW SOUTH WALES: Ranges beyond the Snowy River, *F. Mueller*, Jan. 1855 (MEL). There are two sheets at MEL apparently labelled by Mueller with this name. One of these has no locality label. Since Mueller writes "In montibus ad flumen Snowy River" in his protologue, the specimen so labelled is chosen as lectotype.

Scaevola benthamea Vriese in J.G.C. Lehmann, Pl. Preiss. 1: 411 (1845) = **S. calliptera** *Benth.*

LECTOTYPE: WESTERN AUSTRALIA: In limoso-arenosis, umbrosis prope praedium rusticum cel. Mairu ad fl. Canning, Perth, *Preiss 1520*, d. 2 m. Nov. 1839 (W). ISOLECTOTYPE: P.*

No specimens of this collection have been located at LD or at L.

Scaevola striata *R. Br.*, Prodr.: 586 (1810).

LECTOTYPE: WESTERN AUSTRALIA: King George Third Sound, *R. Brown*, 2 Dec. 1801 (BM). ISOLECTOTYPES: K, MEL.#

Mounted on the same sheet as the lectotype is a specimen labelled 'S. striata ?, Bay I, S. Coast, Jan. 1802'. This specimen, however, has no open flowers and therefore does not correspond to the protologue.

Scaevola striata *R. Br. var.* arenaria *E. Pritzel*, Bot. Jahrb. Syst. 35: 569 (1905).

HOLOTYPE: WESTERN AUSTRALIA: Crescit in distr. Stirling interior. pr. Warrungup, *Diels 4945* (B–destroyed).
NEOTYPE: 1 mile (1.6 km) SE of Kukerin, *Newbey 1509*, 16 Oct. 1964 (PERTH).

Scaevola prostrata Vriese in J.G.C. Lehmann, Pl. Preiss. 1: 406 (1845) = **S. striata** *R. Br.*

LECTOTYPE: WESTERN AUSTRALIA: In solo subarenoso sylvae prope Middleton Bay, *Preiss 1490*, 23 Sept. 1840 (LD 0481). ISOLECTOTYPE: L 909,62. . ..294. K. Krause (1912) reduces this to a synonym of *Dampiera diversifolia*. The type specimens, although very scrappy, appear to be *Scaevola striata*.#

Scaevola phlebopetala *F. Muell.*, Fragm. 2: 18 (1860).

LECTOTYPE: WESTERN AUSTRALIA: Murchison River, *Oldfield* (MEL). ISOLECTOTYPE: K. Two collections of this species, with this labelling, are present in both MEL and K. The collection with the longer sepals and larger flowers is selected as the lectotype since it agrees more with the type description.

Scaevola hamiltonii *K. Krause*, Pflanzenr. 54: 153 (1912).

LECTOTYPE: ?NEW SOUTH WALES: Ohne genauen Standort, *A.A. Hamilton* (NSW). ISOLECTOTYPE: B (destroyed).*

Scaevola chrysopogon *Carolin*, **sp. nov.**

Herba erecta glabra foliis caulinis anguste ellipticis pilis appressis obtectis. Flores sessiles plerumque solitarii. Sepala libera. Ovarium costatum pilis patentibus simplicibus brevis tenuibus obtectum. Indusium barbam chrysodromam densam in pagina posterioreaperens.

HOLOTYPE: WESTERN AUSTRALIA: 16 miles (25.6 km) S of Wannoo Roadhouse, NW Coastal Highway, *George 10367*, 9 Sept. 1970 (PERTH).

Perennial herb or undershrub to 60 cm high. *Stems* terete, slender, markedly striate, glabrous or occasionally with scattered short appressed simple hairs especially around the nodes. *Basal leaves* ovate, tapering or petiolate, 1–4 cm long, 3–10 mm wide, coarsely dentate, densely pubescent; cauline leaves sessile, narrow-elliptic, 2.5–10 cm long, 0.5–2 mm wide, with short appressed simple hairs, entire. *Flowers* axillary, mostly solitary or in cymes with up to 3 flowers, sessile between the bracteoles; bracteoles 2, linear-triangular, 1.2–2.5 mm long. *Sepals* free, triangular to narrow-triangular, 1.4–1.8 mm long, covered with short mostly appressed simple hairs and minute glandular hairs, with short coarse arcuate hairs on the margin. *Corolla* 13–23 mm long, cream to white; lobes apiculate, 7–11 mm long, covered outside with minute glandular hairs and long fine appressed simple hairs becoming shorter and tortuous or arcuate towards the base, with a very dense beard of long fine hairs in throat; barbulae simple; wings 0.7–1 mm wide, sparsely ciliate, mostly rounded at apex. *Stamen* filaments flattened, c. 7 mm long, glabrous; anthers 1.5–1.8 mm long, with a short truncate appendage. *Ovary* 2-locular, ovoid to narrow-ovoid, 3–6 mm long, ribbed, covered with short patent simple and minute glandular hairs; style to 9.5 mm long, glabrous; indusium 2 mm wide, with a dense golden brown beard about 1.5 mm long on posterior surface, with dense marginal bristles c. 0.7 mm long.

RANGE: Peron Peninsula and the region just south of Shark Bay in Western Australia.

DISCUSSION: This species can be distinguished from *S. restiacea* by the finer hairs on the ovary.

SPECIMENS EXAMINED: WESTERN AUSTRALIA: Peron Peninsula, *Carolin 3318*, 28 Aug. 1961 (SYD); 54 km S of Denham, *George 9550*, 26 Aug. 1969 (PERTH); c. 14.5 miles (23.2 km) S of Wannoo, *Phillips*, 17 Sept. 1968 (CBG 025840); E of Nerren-Nerren, *Beard 7111*, 20 Oct. 1974 (PERTH).

Named for the golden brown hairs at the base of the upper surface of the indusium. Greek, *chrysos-* = golden, *pogon* = beard.

Scaevola parvifolia *F. Muell. ex Benth.* subsp. **pilbarae** *Carolin*, **subsp. nov.**

Differt ab subspecie *parvifolia* sepalis sine pilis simplicibus lobis corollae pilis simplicibus tantum basin et apicem versus.

HOLOTYPE: WESTERN AUSTRALIA: 50 km S of Rudall River, *P. Wilson 10545*, 15 Aug. 1971 (PERTH)

Stems covered with minute glandular and simple hairs and ± dense long patent simple hairs. *Basal leaves* lanceolate, to 2 cm long, to 5 mm wide, hairy as stems; cauline leaves ovate to lanceolate, 3–20 mm long, 2–5 mm wide, hairy as stems. *Bracteoles* triangular, 1.5–3 mm long, densely glandular hairy, with scattered long simple hairs. *Sepals* densely glandular hairy, rarely with long simple hairs around the margin. *Corolla* lobes densely glandular-puberulent on the outside occasionally with long simple hairs towards base and on apex.

RANGE: Pilbara region of Western Australia.

HABITAT: Sandy soils.

SELECTED SPECIMENS EXAMINED (26): WESTERN AUSTRALIA: Washing Machine Corner, *Harris 82*, 12 May 1982 (AD 98223490); 56 miles (89.6 km) from Port Hedland on Broome road, *Carolin 7610*, 4 Aug. 1970 (SYD); 72 miles (115 km) from Roy Hill on Wittenoom road, *Carolin 7699*, 7 Aug. 1970 (SYD); South Mt Hodgson, *Davis 174*, 20 Oct. 1979 (PERTH); near Upper Rudall River, *George 10830*, 23 May 1971 (PERTH, SYD); Little Sandy Desert, *Mitchell 517*, 22 July 1979 (NT); 4 miles (6.4 km) N of Jigalong on Rabbit Proof Fence, *Royce 1581*, 13 May 1947 (PERTH); 70 miles (112 km) N of Sandstone towards Wiluna, *Royce 10365*, 14 Oct. 1972 (PERTH).

The subspecific epithet refers to the Pilbara region which is the centre of the distribution (latinized and in the genitive case).

Scaevola parvifolia *F. Muell. ex Benth.* subsp. **acuminata** *Carolin*, **subsp. nov.**

Differt ab subspecie *parvifolia* gemma acuminata.

HOLOTYPE: WESTERN AUSTRALIA: On Depot Springs near bore 25.5 km east of Depot Springs, *Saffrey 1058*, 27 Aug. 1970 (PERTH).

Stems scabrid with minute glandular hairs and patent ± stiff long simple hairs. *Basal leaves* linear, 20–35 mm long, 5 mm wide, densely minutely glandular hairy, with minute simple hairs and long simple hairs; cauline leaves linear to lanceolate, 8–27 mm long, 3–7 mm wide, hairy as basal leaves. *Bracteoles* lanceolate to ovate, 1.5–4 mm long. *Sepals* 2–3 mm long, densely glandular hairy, with long simple hairs. *Corolla* 20–32 mm long; lobes 10–20 mm long, minutely glandular hairy and with patent to retrorse long simple hairs outside; bud acuminate.

RANGE: Austin, Coolgardie and Eucla Regions of Western Australia; Depot Springs to Great Victoria Desert.

DISCUSSION: Can be distinguished from subsp. *parvifolia* by the larger leaves, the larger flowers and the acuminate bud.

SELECTED SPECIMENS EXAMINED (17): WESTERN AUSTRALIA: 5 miles (8 km) from Melma on Leonora road, *Carolin 5894*, 26 Aug. 1967 (PERTH); 12 miles (19.2 km) S of Mt Magnet, *Demarz 5237*, 26 Oct. 1974 (PERTH); 76 km S of Neale Junction, Great Victoria Desert, *George 11948*, 15 Aug. 1974 (PERTH); c. 38 miles (60.8 km) SSW of Queen Victoria Springs, *Helms*, 23 Sept. 1891 (NSW).

The subspecific epithet refers to the shape of the flower bud. Latin, *acuminatus* = with the edges curving inwards and tapering gradually towards the top.

Scaevola patens F. Muell., Fragm. 3: 33 (1862) = **S. depauperata** *R. Br.*

HOLOTYPE: VICTORIA OR QUEENSLAND: Cooper's Creek (MEL). The protologue states 'In deserto juxta Cooper's Creek, *Wheeler*'. The only specimen that I have found corresponding to Mueller's description and even partly corresponding to his label citation is the one here assumed to be the holotype.

Scaevola angulata *R. Br.*, Prodr.: 586 (1810).

LECTOTYPE: NORTHERN TERRITORY: Carpentaria mainl(and), opposite Groote Island, *R. Brown*, 4 Jan. 1801 *and* Carpentaria Islands (BM).
ISOLECTOTYPES: MEL, P.* There is one sheet of this species collected by Brown at BM, attached are two labels as given. It is not possible to determine the application of the labels and there is very little difference between the specimens on the sheet. The whole sheet is selected as the lectotype.

Scaevola pulchella *Carolin*, **sp. nov.**

Suffrutex ad 90 cm altus pilis simplicibus confertis caulis porcatis. Sepala libera. Barbulae corollae papillatae conspicuis alisque ciliatis. Ovarium biloculare pubescens.

HOLOTYPE: WESTERN AUSTRALIA: 80–85 miles (128–136 km) southwards from Onslow, *Beard 2980*, 24 Aug. 1963 (PERTH).

Ascending to prostrate pubescent shrub to 90 cm high. *Stems* ± ridged, slender, covered with long slender soft patent hairs. *Leaves* sessile, linear to elliptic-oblanceolate, 15–40 mm long, 4–10 mm wide, mostly entire to denticulate, pubescent with ± dense simple hairs, larger leaves obtuse and mucronate. *Flowers* in axillary or terminal spikes; bracts linear to oblong, lower bracts occasionally narrow-obovate and leaf-like, to 24 mm long, 1–6 mm wide, hairy as leaves; bracteoles narrow-elliptic to linear, 4–8 mm long, 0.7–1.7 mm wide, pubescent with a conspicuous tuft of silky hairs at the base. *Sepals* ovate-triangular, 1.5 mm long, free or slightly connate at the base, obscured by long hairs on ovary. *Corolla* bluish-mauve, 13–20 mm long, densely covered outside with long simple antrorse to ± patent hairs outside, sparsely bearded inside; lobes 7–11 mm long, 1–1.5 mm wide; wings c. 1 mm wide, sparsely ciliate with simple hairs; barbulae short, densely papillate terminally. *Stamen* filaments 4.5–5.5 mm long; anthers 1.5–2.5 mm long, truncate. *Ovary* 2-locular, ellipsoid, c. 2 mm long, densely covered with long ± patent simple hairs to 2 mm long; style 13–16 mm long, shortly pilose towards base; indusium 1.2 mm wide, glabrous, with short sparse bristles on lips. *Fruit* ellipsoid, 2–3 mm long, hairy as ovary.

RANGE: Carnarvon area and east of Exmouth Gulf in Western Australia.

HABITAT: *Triodia* communities.

DISCUSSION: The presence of free sepals, the ridged stems and the indumentum on the ovary are features which indicate an affinity with *S. hamiltonii* and its relatives.

SELECTED SPECIMENS EXAMINED (12): WESTERN AUSTRALIA: c. 125 km on NW Coastal Highway, *Ashby 4030*, 1 Aug. 1971 (AD 97417316); North West Cape, *Butler 117*, 1963 (PERTH); 3 miles (4.8 km) W of Giralia, *Tomkinson*, Aug. 1963 (PERTH); c. 175 km from Carnarvon to Gascoyne rds. junction on Onslow road, *Ashby 2920*, 16 Aug. 1969 (AD 971020038, PERTH); Mia Mia, NW Coastal Highway, *Ashby 5168*, 26 June 1975 (AD 97631025); c. 3 km S of Lyndon River on NW Coastal Highway, *Ashby 3209*, 14 June 1970 (AD 971040192).

The collector of the holotype notes 'flowers bluish-mauve, pretty' and from this I have selected the specific epithet. Latin, *pulcher* = beautiful, pretty.

Scaevola multiflora Lindley var. *microstachya* Vriese in J.G.C. Lehmann, Pl. Preiss. 1: 407 (1845) = **S. nitida** *R. Br.*

LECTOTYPE: WESTERN AUSTRALIA: In littore arenoso prope Oyster Harbour, *Preiss 1488*, 23 Sept. 1840. The only sheet of this collection which has so far been located is: LD 0477.

Scaevola fastigiata Vriese in J.G.C. Lehmann, Pl. Preiss. 1: 406 (1845) = **S. nitida** *R. Br.*

LECTOTYPE: WESTERN AUSTRALIA: In littore arenoso ad Baldhead, *Preiss 1491*, 16 Oct. 1840 (LD 0468).
ISOLECTOTYPE: L 909.62 . . .561.*

Scaevola flaccida Vriese in J.G.C. Lehmann, Pl. Preiss. 1: 407 (1845) = **S. thesioides** *Benth.*

LECTOTYPE: WESTERN AUSTRALIA: In arenosis prope urbem Fremantle, *Preiss 1521*, 13 Dec. 1838 (LD 0469).
ISOLECTOTYPES: L 903,311-. . ..423, L 903,311-. . ..425, P, W.* Vriese in J.G.C.Lehmann, Pl. Preiss. 2: 243 (1848) himself reduces this to a synonym of *S. thesioides*.

Scaevola paniculata Vriese in J.G.C. Lehmann, Pl. Preiss. 1: 407 (1845) = **S. thesioides** *Benth.*

LECTOTYPE: WESTERN AUSTRALIA: In clivulis calcareis prope Limekiln, Perth, *Preiss 1516*, 5 Jan. 1839 (LD 0502).
ISOLECTOTYPES: K, L 903,311-. . ..426, P, W.*

Scaevola thesioides *Benth.* var. **filifolia** *E. Pritzel*, Bot. Jahrb. Syst. 35: 571 (1905).

HOLOTYPE: WESTERN AUSTRALIA: Distr. Eyre propria Esperance in arenosis, fl. in Nov. *D(iels) 5937* (B-destroyed).
NEOTYPE: 4 miles (6.4 km) S of Trulove, *Blackall 1041*, 15 Oct. 1931 (PERTH).

Scaevola scabrida W. Fitzg., J. R. Soc. W. Australia 3: 215 (1918) = **S. macrostachya** *(Vriese) Benth.*

LECTOTYPE: WESTERN AUSTRALIA: King Leopold Range, *Fitzgerald 788*, May 1905 (NSW).#

Merkusia macrostachya Vriese, Nederl. Kruidk. Arch. 2: 154 (1851) = **Scaevola macrostachya** *(Vriese) Benth.*

LECTOTYPE: WESTERN AUSTRALIA: Various parts of N(orth) W(est) C(oast) (of Australia), *Cunningham* (K).
ISOLECTOYPE: BM.# It is difficult to be sure to which collection at K Vriese was referring. I have treated this as a lectotypification although the two specimens on the sheet selected may have been the only ones he used.

Scaevola caespitosa R. Br., Prodr.: 585 (1810) = **S. globulifera** *Labill.*

LECTOTYPE: WESTERN AUSTRALIA: In collibus sterilibus prope Portum Regis Georgii III m ora australi N. Hollandia, *R. Brown* (BM).
ISOLECTOTYPE: K.*

Scaevola globulifera Labill. var. *humilis* Benth., Fl. Austral. 4: 94 (1868) = **S. globulifera** *Labill.*

LECTOTYPE: WESTERN AUSTRALIA: *Drummond* (K).
ISOLECTOTYPES: MEL.*

Scaevola revoluta R. Br. var. *strigosa* Vriese in J.G.C. Lehmann, Pl. Preiss. 1: 409 (1845) = **S. globulifera** *Labill.*

LECTOTYPE: WESTERN AUSTRALIA: In littore arenoso inter frutices ad Point Possession, *Preiss 1506*, 16 Oct. 1840 (LD 0484).
ISOLECTOTYPE: MEL.*

Scaevola cunninghamii var. *hispida* Benth., F-l. Austral. 4: 92 (1868) = **S. cunninghamii** *DC.*

LECTOTYPE: WESTERN AUSTRALIA: Depuech (Depuch) Islands, *Bynoe* (K).
ISOLECTOTYPE: ?BM.#

Scaevola browniana *Carolin*, **sp. nov.**

Suffrutex ad 1 m. Folia late obovata ad lineari plerumque revoluta pilis longis sericeis strictis axillaribus. Flores in spicis productis ubi fructificantibus bracteis multo magnis minoribus quam folius. Corolla coerulea vel alba glabra versus basim. Ovarium septum ovarii imperfectum. Fructus cylindricus glaber rugosus vel tuberculatus. Bracteae inferiores foliaceae bracteolae plerumque lanceolatae.

HOLOTYPE: WESTERN AUSTRALIA: 6 miles (9.6 km) W of Louisa Downs Hstd., *Maconochie 1150*, 21 May 71 (NT 31143).
ISOTYPES: PERTH, CANB, K.

MISAPPLIED NAME: *Scaevola revoluta* auct. non R. Br. pro parte: Benth., Fl. Austral. 4: 96 (1869); Bailey, Queensl. Fl. 3: 909 (1900); K. Krause, Pflanzenr. 54: 155 (1912); Ewart & Davies, Flora Northern Territory: 268 (1917).

Perennial subshrub to 1 m, occasionally low and spreading, mostly densely tomentose-villous. *Stems* terete, occasionally ridged below the leaves, mostly tomentose-villous, occasionally pilose with long dense patent hairs. *Leaves* broad-obovate to linear, 6–55 mm long, 2–17 mm wide, sometimes shortly mucronate, sometimes denticulate; axillary hairs very long and dense, mostly sericeous, not woolly. *Inflorescence* a terminal or axillary spike, often elongating in fruiting stage and sometimes very long; bracts narrow-lanceolate to broad-ovate or obovate, 3.5–25 mm long, 1–10 mm wide, lower bracts occasionally leaf-like; bracteoles linear to ovate, mostly lanceolate, 2–9 mm long, 0.5 mm wide. *Sepals* reduced to an obscure rim c. 0.3 mm long, glabrous or fringed with short hairs. *Corolla* blue to white, 5–18 mm long, moderately to very densely hairy outside with long straight slender appressed to patent hairs, sometimes glabrous towards base, with a moderately dense to sparse beard; barbulae papillate, distinct; lobes shortly apiculate above wings, 2–6.5 mm long, 0.5–1.2 mm wide; wings 0.2–1 mm wide, rounded at apex. *Stamen* filaments 2.5–5 mm long; anthers 0.8–2 mm long, truncate to emarginate. *Ovary* obovoid to cylindrical, 1–1.5 mm long, glabrous, 2-ovular, with an incomplete septum; style 5–16 mm long, slender, flattened and very recurved towards the corolla lobes, mostly pilose with long slender hairs especially towards base; indusium 1–2 mm wide with sparse short hairs on both surfaces near base or with long slender hairs on posterior side near base, with minute to long bristles on lips. *Fruit* cylindrical, 3–5 mm long, rugose to striate-tuberculate, one-seeded, glabrous.

DISCUSSION: In the past the name *S. revoluta* has been applied to this species. It differs from that species particularly in the narrower bracteoles and the lack of the long ciliate bristles on the bracts and bracteoles. Moreover the bracts frequently intergrade with the leaves.

Named in honour of Robert Brown, the author of 'Prodromus Florae Novae Hollandiae'.

subsp. **browniana**

Leaves 6–36 mm long, 0.2–12 mm wide. Bracts narrow-lanceolate to ovate, occasionally broad-ovate, 3.5–25 mm long, 1–7 mm wide. Bracteoles 2–7 mm long, 0.5–1 mm wide. Corolla white to blue 5–11 mm long; lobes 2–4.5 mm long, 0.5–0.7 mm wide; wings 0.2–0.4 mm wide. Style pilose towards the base; indusium c. 1 mm wide, with sparse short hairs on both surfaces near base, with short to minute bristles on lips. Fruit 3–4 mm long.

RANGE: Hamersley Range, Kimberley region and Upper Fitzroy River in

northern Western Australia; Victoria River, Katherine Gorge, western Arnhem Land in Northern Territory; eastern Barkly Tablelands in Queensland.

HABITAT: In open woodland savannah, on sandstone ranges.

DISCUSSION: This subspecies circumscribes a considerable variation but there appears to be no distinct discontinuities in it.

SELECTED SPECIMENS EXAMINED (48): WESTERN AUSTRALIA: 16 km NW of Newman, *Toelken 6324*, 20 Sept. 1979 (AD 98007110); summit of Mt Bruce, Hamersley Range, *Beard 2919*, 19 Aug. 1963 (PERTH); Sir Graham Moore Island, *Wilson 11204*, 30 June 1973 (PERTH); Mt Anderson, *Broadbent 614*, 25 Jan. 1953 (PERTH). NORTHERN TERRITORY: Victoria River, Kununurra road, *Byrnes 707*, 7 May 1968 (NT 14374, PERTH, SYD); 21 km N of Jim Jim Falls, *Craven 6134*, 29 May 1980 (AD 98232271, CANB); c. 11 miles (17.6 km) SSW of Mt Gilruth, *Lazarides 7931*, 28 Feb. 1973 (CANB); 51 miles S of Hookers Creek Settlement, *Chippendale*, 14 July 1956 (MEL 1521630, NSW 82013, NT 2317). QUEENSLAND: Nicholson River area near Fish River gorge, *Kanis 1761*, 8 June 1974 (CANB, NT 53962).

subsp. **grandior** *Carolin*, **subsp. nov.**

Haec subspecies differt a typo bracteis foliosioribuso et corolla 15–18 mm longa.

HOLOTYPE: WESTERN AUSTRALIA: Hidden Valley 3.2 km E of Kununurra, East Kimberley, *Kenneally 1909*, 3 Aug. 1974 (PERTH).

Leaves obovate to oblong, 12–55 mm long, 3–17 mm wide, obtuse, broadly sessile, tomentose. *Bracts* obovate, 11–22 mm long, 6–10 mm wide, leaf-like. *Bracteoles* lanceolate, 5–9 mm long, 0.5–1 mm wide. *Sepals* connate into an undulate tube c. 0.3 mm long, fringed by sparse simple small hairs. *Corolla* blue, 15–18 mm long, moderately densely hairy outside with long slender antrorse hairs; barbulae papillate, long and distinct; lobes 5–6.5 mm long, 1–1.2 mm wide; wings 0.6–1 mm wide. *Stamen* filaments 5 mm long; anthers 1.5 mm long. *Ovary* c. 1.6 mm long; style c. 14 mm long, pilose with very long patent hairs; indusium c. 2 mm wide, with long slender hairs on posterior side near base, with long bristles on lips. *Fruit* 5 mm long.

RANGE: Kununurra to the junction of the Hann and Fitzroy Rivers in Gardner and Fitzgerald Regions of Western Australia.

DISCUSSION: This subspecies differs from the type in having more leaf-like bracts, a larger corolla with longer and more distinct barbulae, generally larger floral parts and the longer more distinct hairs on the indusium.

SELECTED SPECIMENS EXAMINED (11): WESTERN AUSTRALIA: Hidden Valley, Kununurra, *Ollerenshaw 1674*, 31 May 1975 (CBG 7703666, SYD); Emu Creek E of Kununurra, *Symon 12122*, 19 May 1980 (ADW 54895, SYD); near junction of Hann and Fitzroy Rivers, *Fitzgerald 1173*, June 1905 (PERTH).

The flowers, in particular, are larger than those of the type variety and from this I have taken the varietal epithet. Latin, *grandior* = larger.

Scaevola revoluta *R. Br.*, Prodr.: 586 (1810).

LECTOTYPE: NORTHERN TERRITORY: Carpentaria Islands, *R. Brown*, 20 & 21 Oct. 1802 (BM). ISOLECTOTYPES: K, NSW.#
There are two collections on the lectotype sheet which are virtually indistinguishable from each other.

Scaevola revoluta *R. Br.* subsp. **revoluta** var. **viscida** *Carolin*, **var. nov.**

Differt typo indumento glanduloso.

HOLOTYPE: NORTHERN TERRITORY: Barkly Tableland, Nicholson River area near Dry Creek Gorge in China Wall, *Kanis 1815*, 11 June 1974 (NT 53933).

Differs from the type variety in the very few long simple hairs, which may be quite absent, and the very dense viscid glandular indumentum.

SPECIMEN EXAMINED: QUEENSLAND: 8 miles (12.8 km) SW of Calvert Hills on Creswell Downs Road, *Carolin 9260*, 14 May 1974 (SYD).

Scaevola revoluta subsp. stenostachya (*W. Fitzg.*) *Carolin,* **stat. nov.**

BASIONYM: *Scaevola stenostachya* W. Fitzg., J. Roy. Soc. W. Australia 3: 215 (1918).

HOLOTYPE: WESTERN AUSTRALIA: Near Isdell River, between Isdell Range and Graces Knob, *W. Fitzgerald 880* (NSW).

Merkusia glandulifera DC. var. *eglandulosa* Vriese, Nederl. Kruidk. Arch. 2: 166 (1851) = **Scaevola glandulifera** *DC.*

LECTOTYPE: the type of *Scaevola rufa* Vriese (see below).

Scaevola rufa Vriese in J.G.C. Lehmann, Pl. Preiss. 1: 405 (1845) = **S. glandulifera** *DC.*

LECTOTYPE: WESTERN AUSTRALIA: In calculosis inter frutices sylvae ad radices jugi montium Darlings Ranges, Perth, *Preiss 1513*, 23 Sept. 1839 (LD 0471). ISOLECTOTYPES: L 903,311-. . ..346, P, W.*

Vriese cites *Preiss 1513* under both *Merkusia anchusifolia* and *Merkusia glandulifera* in Natuurk. Verh. Holl. Maatsh. Wetensch. Haarlem ser. 2 10: 67 (1854).

Scaevola glandulifera DC. var. *tenuis* E. Pritzel, Bot. Jahrb. Syst. 35: 570 (1905) = **S. glandulifera** *DC.*

LECTOTYPE: WESTERN AUSTRALIA: In district Avon in collibus apertis a Moore River, *Pritzel 739*, flor. m. oct. (AD). ISOLECTOTYPES: B (destroyed), K, W.*

Scaevola holosericea *Vriese* in J.G.C. Lehmann, Pl. Preiss. 1: 408 (1845).

LECTOTYPE: WESTERN AUSTRALIA: In arenosis sylvae ad montem Eliza mountain Perth, *Preiss 1478*, 23 Sept. 1839 (LD 0472). ISOLECTOTYPES: L 909,62. . ..321, L 903,311-. . ..353, L 903,311-. . ..354, MEL, W.*

Scaevola sphaerocarpa Vriese in J.G.C. Lehmann, Pl. Preiss. 1: 409 (1845) = **S. anchusifolia** *Benth.*

LECTOTYPE: WESTERN AUSTRALIA: In arenosis prope urbiculam Fremantle, *Preiss 1512*, 14 Dec. 1838 (LD 0486). ISOLECTOTYPES: L 909,62. . ..318, MEL, P, W.*

Scaevola eneabba *Carolin,* **sp. nov.**

Frutex pilis antrorsis rigidis. Folia lineari-oblanceolata ad 30 mm longa crassa. Bracteae lanceolatae ciliatae ad 8 mm longae; bracteolatae angustiores ac plus minusve breviores. Corolla c. 9 mm longa extus pilis longis patulis stramineis. Ovarium pilis longis simplicibus albis patulis conferte obtectum.

HOLOTYPE: WESTERN AUSTRALIA: 40 mls (64 km) from Eneabba, *Humphreys*, 15 Oct. 1964 (PERTH).

Erect undershrub to 50 cm, with short antrorse simple hairs. *Leaves* thick, linear-oblanceolate, to 30 mm long, to 1.5 mm wide, entire, obtuse. *Flowers* in terminal spikes to 25 mm long; bracts lanceolate, to 8 mm long, c. 1 mm wide, ciliate; bracteoles similar to bracts but narrower and slightly shorter. *Sepals* deltoid, c. 1 mm long. *Corolla* (colour unknown) c. 9 mm long, pubescent outside with long stiff brownish simple hairs towards top and minute scattered

simple hairs all over, pubescent inside on lobes and in throat; barbulae few, papillate; lobes narrow-elliptic, c. 6 mm long, c. 1 mm wide; wings c. 1.5 mm wide. *Stamen* filaments c. 4 mm long; anthers c. 1 mm long, truncate-emarginate. *Ovary* covered with dense long spreading white simple hairs, 2-locular; style 7–8 mm long, pubescent with long hairs; indusium c. 1 mm long, with a few scattered hairs; bristles on lips widely spaced, weak. *Fruit* 2-locular; mature fruit not seen.

RANGE: Known only from the type collection.

DISCUSSION: Probably related to *S. anchusifolia* but the hairs on the ovary distinguish it.

Named for the locality of the type, which is an Aboriginal word and therefore indeclinable.

Scaevola longifolia Vriese in J.G.C. Lehmann, Pl. Preiss. 1: 410 (1845) = **S. lanceolata** *Benth.*

LECTOTYPE: WESTERN AUSTRALIA: In solo limoso planitie ad fluvium Vasse River, Sussex, *Preiss 1472*, 7 Dec. 1839 (LD 0474). ISOLECTOTYPES: L 903,311-...398, L 903,-.311...394, MEL, P, W. (see *S. virgata*).

Scaevola virgata *Carolin*, **sp. nov.**

Suffrutex virgatus perennis ad 45 cm. Folia linearia ad oblanceolata ad basim caulis amplectentia et pilis longis strictis vel tortuosis obtectis. Sepala in tubo connata margine sinuato vel truncato. Corolla alba vel coerulescens pallide 5–8 mm longi pilis sparsis extus obtectis plus minusve glabris ad basim. Fructus globuloso-cylindricus duobus loculis sterilibus et duobus loculis foecundis grandioribus.

HOLOTYPE: WESTERN AUSTRALIA: Between Northampton and Geraldton, *Ashby 1026*, 23 Aug. 1964 (AD 96523133). ISOTYPE: SYD.

Tufted usually much branched perennial subshrub to 45 cm. *Stems* terete, villous. *Leaves* linear to oblanceolate, 2–6 cm long, 3–8 mm wide, acute, mostly broadened and ± stem-clasping at base, entire to dentate, covered with ± dense long fine straight to tortuous hairs. *Inflorescence* a terminal or rarely axillary spike; bracts ovate to narrow-ovate, 4–27 mm long, 2–5 mm wide, acute to very acuminate, ± stem-clasping, covered with long fine straight hairs especially on margins and inner surface; bracteoles narrow-lanceolate, 3–6 mm long, 0.5–1 mm wide. *Sepals* connate into a sinuate or truncate rim, 0.25 mm long, glabrous. *Corolla* white to pale blue, 5–8 mm long, covered outside with ± sparse fine hairs, with sparse simple hairs inside; barbulae papillate and simple; lobes 2.5–4 mm long, 0.5–1 mm wide, apiculate above wings; wings 0.5–1 mm wide, obtuse to truncate. *Stamen* filaments 1.5 mm long; anthers 0.5 mm long, truncate. *Ovary* broad-ellipsoid, to 1 mm long, glabrous, 2-locular; style 3–4 mm long, covered with long fine hairs; indusium c. 1 mm wide with sparse short hairs at base and ± dense marginal bristles to 0.2 mm long. *Fruit* globular-cylindrical, c. 3 mm long, 2 mm wide, rugose, glabrous, with 2 locules containing seeds and 2 smaller sterile locules; endocarp bony, thick; mesocarp spongy, thin.

RANGE: Ogilvie Plains to Watheroo in southern Irwin and northern Drummond districts of Western Australia.

HABITAT: Scrubs or heath on rocky soils.

DISCUSSION: This species seems close to *S. lanceolata* and this name has indeed been applied to it. However the type of *S. lanceolata* is clearly not conspecific with it. The indumentum of *S. virgata* is finer, the hairs on the corolla are much less dense and even tending to be absent altogether from the base. *S. longifolia* is the name which has been most generally applied to it in the past but the type of that species is a specimen of *S. lanceolata*.

SELECTED SPECIMENS EXAMINED (34): WESTERN AUSTRALIA: Ogilvie Plains, *Blackall 4502*, 30 Aug. 1940 (PERTH); Northampton, *Carolin 3240*, 28 Aug. 1961 (SYD); Mt Sewell near Oakabella, *Green 445*, 11 Aug. 1956 (PERTH); 20 miles (32 km) N of Geraldton, *Newbey 2188*, 28 Aug. 1965 (PERTH); 10 miles (16 km) E of Geraldton, *Shaw 591*, 1 Oct. 1966 (AD 96832196); 27 miles (43.2 km) SE of Walkaway on Burma Road, *George 7853*, 4 Sept. 1966 (PERTH); Coorow–Carnamah, *Beard 1954*, 25 Sept. 1962 (PERTH); 14 miles (22.4 km) N of Badgingarra, *George 6729*, 13 Aug. 1965 (PERTH); Dinner Hill, c. 30 miles (48 km) W of Watheroo, *Carolin 3400*, 1 Sept. 1961 (SYD).

Named for the habit. Latin, *virgatus* = twiggy.

Scaevola suaveolens R. Br., Prodr.: 585 (1810) = **S. calendulacea** *(Kennedy) Druce.*

LECTOTYPE: NEW SOUTH WALES: Botany Bay, *R. Brown* (BM).# All the collections made by Brown fit his description quite well but only this one has a ripe fruit from which he could have determined it was a "berry".

Scaevola spicigera *Carolin,* **sp. nov.**

Frutex expansus ad 50 cm pilis mollibus sericeis et glandulosis parvis obtectus. Folia oblongo-elliptica anguste 35–60 mm longa pilis sericeis in axillis. Flores in thyrsi spiciformes numerosi dispositi. Corolla alba 5–6 mm longa. Ovarium loculo uno. Indusium setis brevissimis in labiis dispositis. Fructus oblongus rugosus costatus plerumque semene solitario.

HOLOTYPE: WESTERN AUSTRALIA: 79 miles (126.4 km) S of Learmonth, *George 2399*, 2 June 1961 (PERTH).

Low spreading ± silky hairy shrub to 50 cm. *Leaves* narrow-oblong-elliptic to oblanceolate, 35–60 mm long, 3–8 mm wide, often more densely hairy below, entire, acute, tapering gradually towards base with a conspicuous tuft of silky axillary hairs. *Flowers* arranged in numerous spike-like axillary thyrses to 20 cm long; bracts leaf-like but smaller; bracteoles lanceolate, 4–6 mm long, to 2 mm wide, c. ½ as long as flowers or longer. *Sepals* reduced to a minute sinuate rim. *Corolla* white, 5–6 mm long, pubescent outside with ± appressed simple hairs, pubescent in throat; barbulae simple, scarcely distinguishable from hairs; lobes oblong-elliptic, c. 2.5 mm long, c. 0.5 mm wide; wing <0.5 mm wide, laciniate; connate part of lobes 2.5–3.5 mm long. *Stamen* filaments linear, c. 1 mm long; anthers oblong, c. 0.5 mm long. *Ovary* obovoid, pubescent, 1-locular except at base, with 2 ovules; style 2–2.5 mm long, glabrous except at base; indusium semi-orbicular, 0.5–1 mm long, glabrous except for a few short hairs close to base and very short bristles on lips. *Fruit* cylindrical, 3 mm long, pubescent, ribbed, rugose, usually with a single seed; epicarp very thin, dry, brown; endocarp thin.

RANGE: Vlaming Peninsula of Western Australia.

HABITAT: In *Triodia* grassland on red sandy soils.

DISCUSSION: Similar to *S. canescens* but the simple hairs are much less dense and accompanied by glandular ones. The inflorescences are more spike-like with longer internodes and the axillary hairs are silky and separate rather than woolly and felted.

SPECIMENS EXAMINED: WESTERN AUSTRALIA: 10 miles (16 km) E of Ningaloo HS., *George 10235*, 4 Oct. 1970 (PERTH); Learmonth Road, 44 miles (70.4 km) S of Bullara turnoff, *George 3287*, 22 Nov. 1962 (PERTH); Cardabia Station turnoff on Learmonth Road, *Beard 3536*, 20 Aug. 1964 (PERTH); ± 55 miles (88 km) N of Minilya River on road to Learmonth, *George 1434*, 31 Aug. 1960 (PERTH).

Named for the spike-like inflorescences. Latin, *spica* = spike, *-ger* = bearing.

Scaevola glaucescens Vriese in J.G.C. Lehmann, Pl. Preiss. 1: 410 (1845) = **S. canescens** *Benth.*

LECTOTYPE: WESTERN AUSTRALIA: In arenosis prope urbiculam Perth, *Preiss 1477*, 15 April 1839 (LD 0463). ISOLECTOTYPES: K, L 903,311-. . ..326, L 903,311-. . ..327, MEL 1521288, P, W.*

Scaevola trinervis Vriese in J.G.C. Lehmann, Pl. Preiss. 1: 407 (1845) = **S. canescens** *Benth.*

LECTOTYPE: WESTERN AUSTRALIA: In arenosis umbrosis sylvae prope lacum Keremulu, *Preiss 1479*, 16 Aug. 1839 (LD 0464). ISOLECTOTYPES: K, MEL.*

Scaevola sericophylla *F. Muell. ex Benth.*, Fl. Austral. 4: 102 (1868).

LECTOTYPE: WESTERN AUSTRALIA: Murchison River, *Oldfield* (K).?# There are two sheets at K, both labelled apparently by Mueller, one as *S. sericophylla* and the other as *S. oldfieldii* var. *sericophylla*. Both are also annotated by Bentham. One only, however, is clearly labelled "Murchison River". It is this specimen which is selected as the lectotype.

Scaevola repens *Vriese* in J.G.C. Lehmann, Pl. Preiss. 1: 406 (1845).

LECTOTYPE: WESTERN AUSTRALIA: In arenosis sylvae prope urbiculam Perth, *Preiss 1519*, 20 Oct. 1839 (LD 0480). ISOLECTOTYPES: L 903,311-. . ..415, L 903,311-. . ..414, MEL, P, W.

Scaevola repens *Vriese* var. **angustifolia** *Vriese* in J.G.C. Lehmann, Pl. Preiss. 1: 406 (1845).

LECTOTYPE: WESTERN AUSTRALIA: In arenosis umbrosis ad fl. Cygnorum, *Preiss 1493*, June 1839. The only sheet of this collection which has so far been located is LD 0480.

Scaevola oldfieldii *F. Muell.*, Fragm. 2: 19 (1860).

LECTOTYPE: WESTERN AUSTRALIA: In campis arenosis et clivis rupestris ad flumen Murchison, *A. Oldfield* (MEL). Isolectotypes: MEL, K. There are two specimens at MEL which are candidates for the type, but only one is labelled as collected by Oldfield. This is selected as the lectotype.#

Scaevola humifusa *Vriese* in J.G.C. Lehmann, Pl. Preiss. 1: 410 (1845).

LECTOTYPE: WESTERN AUSTRALIA: In solo sublimoso-arenoso planitie ad flumen Avon River, *Priess 1480*, 10 Sept. 1839 (LD 0473). ISOLECTOTYPES: L 903,311-. . ..356, L 903,311-. . ..358, MEL, P, W.*

Scaevola depressa *Vriese* in J.G.C. Lehmann, Pl. Preiss. 1: 410 (1845).

LECTOTYPE: WESTERN AUSTRALIA: In regionibus interioribus Australiae meridonali-occidentalis, *Preiss 1502*, Nov. 1840 (LD 0467). ISOLECTOTYPE: L 909,62. . ..719 (pro parte). The specimen at LD is so poor that an identification is practically impossible. The sheet in L has three pieces mounted on it and two labels, i.e., *Preiss 1505* and *Preiss 1502*, the latter contained in an otherwise empty cellophane packet. It is not possible to determine which specimen belongs to which label. One specimen is *S. humifusa* and the other is *S. longifolia*.

Scaevola humifusa var. *pulvinaris* E. Pritzel, Bot. Jahrb. Syst. 35: 572 (1905) = **S. pulvinaris** *(E. Pritzel) K. Krause.*

HOLOTYPE: WESTERN AUSTRALIA: Bei Cranbrook an feuchten Platzen auf Kahlen Flachen, *Diels 4403*, flor sept. (B-destroyed). NEOTYPE: 28.5 miles (45.6 km) N of Ravensthorpe, *George 314*, 13 Sept. 1959 (PERTH).

Scaevola arenaria E. Pritzel, Bot. Jahrb. Syst. 35: 572 (1905) = **S. humifusa** *Vriese*

LECTOTYPE: WESTERN AUSTRALIA: Hab. in distr. Avon pr. Tammin in arenosis apertis aridis, *Pritzel 754*, Oct. 1839 (K). ISOLECTOTYPES: BM, W.#

Scaevola globosa *(Carolin) Carolin*, **comb. nov.**

BASIONYM: *Nigromnia globosa* Carolin, Nuytsia 1: 292 (1974).

See above.

Scaevola linearis *R. Br.*, Prodr.: 586 (1810).

LECTOTYPE: SOUTH AUSTRALIA: Bay X, South Coast, *R. Brown* (BM). ISOLECTOTYPE: K.*

Scaevola linearis *R. Br.* subsp. **confertifolia** *(J. Black) Carolin*, **comb. nov.**

BASIONYM: *Scaevola linearis* R. Br. var. *confertifolia* J. Black, Fl. S. Australia. ed. 1: 565 (1929).

LECTOTYPE: SOUTH AUSTRALIA: Kangaroo Island, *J.B. Cleland*, 16 Nov. 1924 (AD). ISOLECTOTYPE: ?K.

Scaevola paludosa *R. Br.*, Prodr.: 586 (1810).

LECTOTYPE: WESTERN AUSTRALIA: Bay I, South Coast, *R. Brown*, 12 Jan. 1802 (BM)#. A specimen at K is dated 11 Jan. and is thus probably not strictly an isolectotype.

Scaevola ovalifolia *R. Br.*, Prodr.: 584 (1810).

LECTOTYPE: NORTHERN TERRITORY: Carpentaria, R. Brown (BM). ISOLECTOTYPE: MEL.*

Brown recognized two variations in this species. Specimens of both α and β are mounted on the same sheet at BM but there is no difficulty in distinguishing the glabrous form from the hairy one. *S. ovalifolia* α *cinerascens* is taken as the type to conform with current use. β *glabra* is now included under *S. glabrata* Carolin.

Scaevola glutinosa *Carolin*, **sp. nov.**

Frutex erectus plerumque viscidus ad 70 cm pilis glandulosis simplicibusque patentibus longis. Folia obovata dentata sessilia. Bracteae minores. Bracteolae circa ¼-plo longiore quam corolla. Corolla 14–24 mm longa. Indusium basi breviter barbatum. Ovarium duabus loculis.

HOLOTYPE: QUEENSLAND: Granada, about 50 miles (80 km) N of Cloncurry, *Everist 5225*, 11 April 1954 (BRI 231469).

Erect, ± spreading usually viscid shrub to 70 cm high, pubescent with soft patent simple hairs and patent glandular hairs usually as long as the simple ones. *Leaves* obovate, 20–68 mm long, 6–26 mm wide, dentate, with an acute tooth at apex, sessile and at least upper ones broad and almost stem-clasping at base, pubescent as stems. *Flowers* in terminal spikes which elongate in fruiting stage to 12 cm long; bracts smaller than leaves, ovate-elliptic, to 15 mm long, slightly smaller towards top, dentate or entire, acute-acuminate; bracteoles linear-lanceolate, 7–11 mm long, c. 1/4 as long as corolla. *Sepals* connate into a sinuate rim 0.5–1 mm long. *Corolla* blue 14–24 mm long, pubescent outside with patent hairs, tomentose in throat; barbulae simple; lobes narrow-ovate, 6–11 mm long, to 1.7 mm wide; wings to 10 mm wide; connate part of corolla

8–13 mm long. *Stamen* filament 2–3 mm long; anthers narrow-oblong, 1–2 mm long, obtuse or truncate. *Ovary* pubescent with fine mostly simple hairs, 2-locular to top, 1.5–30 mm long; style 5–8.5 mm long, usually with a few scattered hairs; indusium depressed-obovate to 2 mm long, to 2.5 mm wide, glabrous below or with a few scattered long hairs, with a sparse beard of a few white bristles less than or scarcely equalling bristles on lips above. *Fruit* cylindrical, 4–6 mm long, ± pubescent, rugose with 2 fertile locules and 2 small sterile cavities; mesocarp green, dry, thin; endocarp hard, woody.

RANGE: Northern Queensland in Cloncurry region.

HABITAT: Frequently on limestone.

DISCUSSION: The long viscid glandular hairs together with the patent simple hairs, the sparse short beard on the back of the indusium and the ± stem-clasping upper leaves distinguish this species from other members of series *Pogogynae.* The flowering spikes are more compact than most other species of this Section and the transition from leaves to bracts is more abrupt.

SELECTED SPECIMENS EXAMINED (11): QUEENSLAND: Digby Peaks Range, *Purdie 1047,* 10 Sept. 1977 (BRI 232747); 2 miles (3.2 km) S of Duchess, *Ollerenshaw & Kratzing 1249,* 6 Aug. 1974 (CBG 058322, BRI 201263); 32 miles (51.2 km) E of Cloncurry, *Lazarides 4071,* 9 Sept. 1953 (BRI 017290, CANB, NT 18784); "Sutherland" 60 miles (96 km) NW of Maxwelton, *Nelson & Entwistle 14,* 24 April 1963 (BRI 039198).

The specific epithet refers to the stickiness of the plant. Latin, *glutinosus* = glutinous, sticky.

Scaevola densifolia *Carolin,* **sp. nov.**

Suffrutex prostratus pubescens. Folia oblanceolata 8–30 mm longa semper fasciculata. Flores in spicis foliosis. Bracteolae ad ½-plo longiores quam corolla instructus. Fructus late ovoideus gibbosus ac seriebus duabus tuberculorum.

HOLOTYPE: WESTERN AUSTRALIA: Hamersley River, *Allan 180,* 8 Nov. 1969 (PERTH). ISOTYPE: SYD.

Prostrate undershrub to 40 cm, pubescent with very short simple patent hairs and some longer ones. *Leaves* oblanceolate, 8–30 mm long, 2–9 mm wide, entire or sometimes with a prominent tooth on either side, mostly obtuse, tapering towards the base, often fasciculate in axils. *Flowers* in leafy spikes, sessile between the bracteoles; peduncles to 2 mm long; bracteoles linear, 5–7 mm long, c. 5 mm wide, to ½ as long as corolla. *Sepals* triangular, to 2.5 mm long, connate into a tube to 0.5 mm long, sericeous. *Corolla* white or cream, 7–17 mm long, densely pubescent outside with coarse simple appressed hairs towards top becoming smaller and less appressed below, tomentose in throat; barbulae few, thin, simple, scarcely distinguishable from the hairs; lobes narrow-oblong-elliptic, 3–6 mm long, to 1.5 mm wide; wing to 1 mm wide; connate part of corolla 6–11 mm long. *Stamen* filament 2–4 mm long; anthers narrow-oblong, 1–2 mm long, truncate. *Ovary* pubescent, 2-locular, 1.5–3 mm long; style glabrous, 3–6 mm long; indusium semi-orbicular to semi-elliptic, 1–2 mm long, 1.5–2.5 mm wide, with a few short hairs at base on the upper surface not exceeding bristles on lips. *Fruit* broad-ovoid, 3–4 mm long, with two large lateral protuberances and a band of tubercles on posterior and anterior surface, pubescent with 2 fertile locules and 2 sterile cavities which almost join across the septum.

RANGE: Eyre Region of Western Australia.

DISCUSSION: Previously misplaced in *S. paludosa*. The fruit with two lateral protuberances and two bands of tubercles is unique in the genus.

SELECTED SPECIMENS EXAMINED (9): WESTERN AUSTRALIA: c. 58 km N of Oldfield River, *Eichler 20391*, 21 Oct. 1968 (AD 97018210, CANB, PERTH); West River, *Newbey 1726*, 13 Dec. 1964 (PERTH); Ravensthorpe, *Gardner*, Nov. 1944 (PERTH); Hamersley River, *George 1971*, 2 Dec. 1960 (PERTH); Fitzgerald River, *George 10561*, 19 Nov. 1970 (PERTH).

Named for the leaves which are crowded on the lateral branches. Latin, *densus-* = dense, *-folium* = leaved.

Scaevola aemula *R. Br.*, Prodr.: 584 (1810).

LECTOTYPE: SOUTH AUSTRALIA: Bay X, South Coast, *R. Brown*, 1802 (BM). ISOLECTOTYPES: K, MEL.*

Scaevola sinuata R. Br., Prodr.: 584 (1810) = ? **S. aemula** *R. Br.*

LECTOTYPE: WESTERN AUSTRALIA: Goose Island Bay, *R. Brown*, May 1803 (BM). ISOLECTOTYPES: K, MEL.*

Scaevola humilis *R. Br.*, Prodr.: 585 (1810).

LECTOTYPE: SOUTH AUSTRALIA : Inlet XII, South Coast, *R. Brown* (BM). ISOLECTOTYPE: K.*

Scaevola pallida *R. Br.*, Prodr.: 585 (1810).

LECTOTYPE: VICTORIA: In campis graminosis Port Phillip, *R. Brown*, 25–28 Jan. 1804 (BM).#

Brown's protologue in the Prodromus only indicates that the species was collected along the southern coast of Australia. There are at least two collections corresponding to Brown's manuscript description, the lectotype and one at K labelled Port Phillip, *R. Brown*, May 1802.

Scaevola auriculata *Benth.*, Fl. Austral. 4: 99 (1868).

LECTOTYPE: WESTERN AUSTRALIA: *Drummond 3rd coll. no. 153* (K). ISOLECTOTYPES: BM, MEL.#

There are two sheets at K bearing collections with this number, one bears a specimen of no. 153, the other bears a specimen of no. 157 as well. The lectotype is the sheet bearing the single collection.

Molkenboeria microphylla Vriese, Natuurk. Verh. Holl. Maatsch. Wetensch. Haarlem ser. 2 10: 44 (1854) = **Scaevola microphylla** *(Vriese) Benth.*

LECTOTYPE: WESTERN AUSTRALIA: ad flum. Cygn., *Drummond* (K). ISOLECTOTYPES: L 909.62. . ..566, LD 0487.

Since Vriese cites "Herb. Hook." in the protologue, the specimen at K is selected as lectotype.

Molkenboeria macrophylla Vriese, Natuurk. Verh. Holl. Maatsch. Wetensch. Haarlem ser. 2 10: 44 (1854) = **Scaevola macrophylla** *(Vriese) Benth.*

HOLOTYPE: WESTERN AUSTRALIA: Nov. Holl. ad fl. Cygn. Spec. Drummondii (K).

Scaevola platyphylla *Lindley*, Sketch Veg. Swan R.: 26 (1839).

This name was published on 1 December 1839. *Scaevola semiamplexicaulis* DC., Prodr. 7: 509 (1839) was published in 'late December'. The former name thus has priority by a few weeks.

Scaevola candollei *Vriese* in J.G.C. Lehmann, Pl. Preiss. 1: 405 (1845) = *S. platyphylla* Lindley.

LECTOTYPE: WESTERN AUSTRALIA: In confragosis jugi montium Darling's Range Perth, *Preiss 1497*, Sept. 1841. (L 909,62. . ..569). ISOLECTOTYPE: MEL 1521496.

Taxa here excluded from *Scaevola*

Typification of those species to be transferred to *Goodenia* will appear in the corresponding paper on *Goodenia*.

Scaevola umbellata Vriese in J.G.C. Lehmann, Pl. Preiss. 1: 411 (1845) = **Goodenia pulchella** *Benth.*

LECTOTYPE: WESTERN AUSTRALIA: In humidis umbrosisque prope urbiculam Perth, *Preiss 1435a*, 25 March 1839 (LD 0451). ISOLECTOTYPE: W. The species is clearly treated differently from its variations by Vriese and must thus be recognised as a separate taxon from any of them.# The variations given below are not designated as varieties by Vriese and therefore have no taxonomic status.

α **procumbens** *Vriese*, op. cit.: 412

SPECIMEN CITED: WESTERN AUSTRALIA: In arenosis aridis prope villam ccl. Andrews ad flum. Cygnorum, *Preiss 1451*, 2 Feb. 1839 (LD 0451 mounted on the same sheet as the type of the species).

β **denticulata** *Vriese*, op. cit.: 412

SPECIMEN CITED: WESTERN AUSTRALIA: In arenosis prope urbiculam Freemantle, *Preiss 1428*, 26 Dec. 1839 (LD 0452). DUPLICATES: G, L 903,311-. . ..251, L 903,311-. . ..252, W.*

γ **spathulata** *Vriese*, op. cit.: 412

SPECIMEN CITED: WESTERN AUSTRALIA: In solo sublimoso-arenoso Peninsulae Perth, *Preiss 1430*, 15 May 1839 (LD 0452 mounted on the same sheet as a specimen of β *denticulata*). DUPLICATES: G, L 903,311-. . ..252, L 903,311-. . ..253, W.*

Scaevola tenera Vriese in J.G.C. Lehmann, Pl. Preiss. 1: 409 (1845) = **Goodenia coerulea** *R. Br.*

LECTOTYPE: WESTERN AUSTRALIA: In regionibus interioribus Australiae meridionali-occidentalis, *Preiss 1442*, Feb. 1841 (LD 0448). ISOLECTOTYPES: G, L 909,62. . ..340.* Although Vriese describes var. β (see below), he does not describe a var. α as such.

var. β **pauciflora** *Vriese*, op. cit.: 409

LECTOTYPE: WESTERN AUSTRALIA: In arenosis districtus Sussex, *Preiss 1482*, 20 May 1839 (LD 0448). ISOLECTOTYPES: G, L 903,311-. . ..240, P, W.#

Scaevola stricta Vriese in J.G.C. Lehmann, Pl. Preiss. 1:408 (1845) = **Goodenia scapigera** *R. Br.*

LECTOTYPE: WESTERN AUSTRALIA: In rupestris ad latera collium Konkoberuphills, Kent, *Preiss 1511*, 19 Nov. 1840 (LD 0466). ISOLECTOTYPES: G, L 903,311-. . ..295, P.* The specimen at W labelled with this number does not seem to belong to Goodeniaceae.

Scaevola pusilla Vriese in J.G.C. Lehmann, Pl. Preiss. 1:412 (1845) = **Goodenia tenella** *R. Br.*

LECTOTYPE: WESTERN AUSTRALIA: In solo humoso humido umbroso ad Eight-mile Bridge, Plantagenet, *Preiss 1470*, Feb. 1841 (LD 0483). ISOLECTOTYPES: G, L 909,62-. . ..385).*

Scaevola pterosperma Vriese in J.G.C. Lehmann, Pl. Preiss. 1: 408 (1845) = **Goodenia incana** *R. Br.*

LECTOTYPE: WESTERN AUSTRALIA: Ad promontorium Cape Riche, *Preiss 1499*, 24 Nov. 1840 (LD 0482). ISOLECTOTYPES: G, L 903,311-. . ..275, MEL 24038, P, W.#

Scaevola reinwardtii Vriese in J.G.C. Lehmann, Pl. Preiss. 1: 409 (1845) = **Verrauxia reinwardtii** *(Vriese) Benth.*

LECTOTYPE: WESTERN AUSTRALIA: In planitie arenosa Quangen, Victoria, *Preiss 1454*, 20 March 1844 (W).*

Scaevola geniculata Vriese in J.G.C. Lehmann, Pl. Preiss. 1: 404 (1845) = **Goodenia affinis** *(Vriese) Vriese.*

LECTOTYPE: WESTERN AUSTRALIA: In rupestribus promontorii Cape Riche, *Priess 1503*, 20 Nov. 1840 (LD 0470). ISOLECTOTYPE: MEL 24312.*

Scaevola verreauxii *F. Muell.*, Bot. Teachings: 65 (1877) ex Index Kewensis 2: 821 (1895) is an error for *'Scaevola* and *Verreauxia'.*

Temminckia macrophylla Vriese, Nederl. Kruidk. Arch. 2: 146 (1851). This is not a member of the Goodeniaceae.

Temminckia microcarpa Nadeaud as cited in Index Kewensis, suppl. 2: 181 (1904) is a mistake and should read *Terminalia microcarpa* Nadeaud.

Taxon of uncertain position

Scaevola lyratifolia *Vriese* in J.G.C. Lehmann, Pl. Preiss. 1: 405 (1845)

There are no flowers on the specimens and it is not possible, as yet, to determine its correct placement.

LECTOTYPE: WESTERN AUSTRALIA: In saxosis prope catarractam capitis fluvii Cygnorum, *Preiss 1485*, 25 July 1839 (LD 0475). ISOLECTOTYPE: MEL 1521315.

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Appendix 1

Terminal taxa arranged in alphabetical order showing constituent taxa

ACAC *S. acacioides* is not included since some important data are lacking.
AEMU *S. aemula, S. amblyanthera, S. humilis*
ALBI *S. albida*
ANCH *S. anclusifolia, S. enneaba*
ANGS *S. angustata*
ANGU *S. angulata*
AURI *S. auriculata, S. microphylla*
BASE *S. basedowii*
BECK *S. beckii*
BROO *S. brookeana*
BROW *S. browniana*
BURS *S. bursariifolia*
CALE *S. calendulacea*
CANE *S. canescens, S. spicigera*
CHAM *S. chamissoniana, S. gaudichaudiana, S. procera*
CHRY *S. chrysopogon*
COCC *S. coccinea*
COLL *S. collaris*
CORI *S. coriacea*
CRAS *S. crassifolia*
CUNE *S. cuneiformis*
CUNN *S. cunninghamii*
DENS *S. densifolia*
DEPA *S. depauperata*
FRUT *S. sericea*
GAUD *S. gaudichaudii*
GLAB *S. glabra*
GLAT *S. glabrata*
GLAN *S. glandulifera*
GLOB *S. globulifera*
GLUT *S. glutinosa*
GRAC *S. gracilis, S. porrecta*
GRAM *S. graminea*
HAMI *S. hamiltonii*
HOOK *S. hookeri*

HUMI *S. humifusa*
KILA *S. kilaueae*
LACI *S. laciniata*
LANC *S. lanceolata*
LINE *S. linearis, S. paludosa*
MACR *S. macrostachya*
MARQ *S. marquesensis*
MOLL *S. mollis*
MONT *S. montana, S. indigofera, S. tahitensis, S. floribunda*
MYRT *S. myrtifolia*
NITI *S. nitida*
NIGR *Nigromnia globosa*
OPPO *S. oppositifolia*
OVAL *S. ovalifolia*
OXYC *S. oxyclona*
PARB *S. parvibarbata*
PARV *S. parvifolia*
PAUC *S. pauciflora, S. verticillata*
PILO *S. pilosa*
PLAT *S. platyphylla, S. macrophylla*
PLUM *S. plumieri, S. socrataensis, S. hainanensis*
PORO *S. porocarya*
PROC *S. procera*
PULC *S. pulchella*
RACI *S. racimigera*
RAMO *S. ramosissima*
REPE *S. repens, S. oldfieldii*
REST *S. restiacea*
REVO *S. revoluta*
SERI *S. sericophylla*
SPIN *S. spinescens*
STRI *S. striata, S. calliptera, S. plilebopetala*
SUBC *S. subcapitata*
TENU *S. tenuifolia*
THES *S. thesioides*
TOME *S. tomentosa*
TORT *S. tortuosa*
VIRG *S. virgata*

Appendix 2

List of characters used in the cladistic analysis

1. Shrubs and climbers: 0; undershrubs: 1; multicaulate from a stock: 2.
2. Viscid on young parts: 0; not viscid on young parts: 1.
3. Stems not ribbed: 0; stems ribbed: 1.
4. Cauline leaves normally developed: 0; cauline leaves reduced to triangular 'scales' less than 5 mm long: 1.
5. Leaf base not stem-clasping: 0; leaf base stem-clasping: 1.
6. Simple hairs present: 0; simple hairs absent: 1.
7 and 8. Glandular hairs absent: 00; glandular hairs with ± globular heads: 01; glandular hairs peltate: 02; glandular hairs pseudostellate: 11.
9. Compound thyrse: 0; thyrse reducing to a raceme or spike above: 1; raceme or spike: 2.

10. Inflorescences mostly terminal: 0; inflorescences mostly axillary: 1.
11. Bracts all ± same size as leaves: 0; bracts reducing in size towards apex: 1; bracts mostly reduced: 2.
12. Bracts without marginal bristles: 0; bracts with marginal bristles: 1.
13. Bracteoles similar to leaves but smaller: 0; bracteoles much smaller than leaves, ± lanceolate: 1; bracteoles minute: 2.
14. Flowers pedunculate: 0; peduncle almost obsolete: 1.
15. Sepals mostly > 1.5 mm long: 0; sepals < or = 1.5 mm long: 1.
16. Sepals free: 0; sepals connate with distinct lobes sepals: 1; connate into an undulate rim: 2.
17. Corolla not bearded inside: 0; corolla bearded inside: 1.
18. Barbulae broad (mostly 0.2 mm wide or more), flat: 0; barbulae narrow (<0.2 mm wide) ± terete: 1.
19. Stiff hairs in place of barbulae: 0 (does not occur in *Scaevola*); barbulae aculeate with stiff hairs: 1; barbulae papillate at top: 2; barbulae simple: 3; barbulae absent: 4.
20. Apex of anther glabrous: 0; apex of anther hairy: 1;
21. Hairs present on lips of indusium: 0; hairs absent from lips of indusium: 1.
22. 23 and 24. Indusium with hairs scattered over the upper surface: 000; indusium with a few basal hairs on the upper surface: 010; indusium glabrous on the upper surface: 020; indusium with a stiff erect beard at the base on the upper surface equalling or exceeding the bristles on the lips: 100; indusium with a short flat beard on the upper surface: 200; indusium with a short flat dense beard on upper surface: 101.
25. Mesocarp dry : 0; mesocarp fleshy: 1.
26. Fruit with four fertile locules: 0; fruit with two fertile locules and two sterile locules: 1; fruit with two fertile locules only: 2; fruit with only one fertile locule: 3.
27. Endocarp smooth: 0; endocarp rugose: 1.
28. Fruit glabrous: 0; fruit hairy: 1.
29. Flower pedicillate: 0*; flower sessile in bracteoles: 1.

Appendix 3

Character states of terminal taxa

Outgroup	10000 00110 00000 00000 00000 0000
S. sericea	00000 00100 00100 01010 00001 1100
S. plumieri	00000 00100 00101 11010 00001 1101
S. coriacea	00000 11120 00201 21?00 00001 1001
S. kilaueae	00000 11100 00101 20010 00001 1101
S. gaudichaudii	00000 11120 00101 20?40 00001 1001
S. chamissoniana	00000 01100 00101 20?40 00201 1001
S. mollis	00000 11110 00101 10?40 00201 1001
S. spinescens	00000 01121 00101 21120 00001 2001
S. bursariifolia	01000 01120 00111 21120 00001 2001
S. myrtifolia	01000 01120 00101 21120 00201 2001
S. tomentosa	00000 01121 00001 21130 00201 2001
S. montana	00000 00100 00100 01010 00001 1111

S. beckii	00000	00011	20101	00110	00201	1001
S. glabra	00000	10020	00210	01?40	00201	1000
S. coccinea	00000	10020	00210	01?40	00201	1000
S. subcapitata	00000	00000	20210	01?41	00201	1101
S. marquesensis	00000	10000	00100	11?40	00201	1100
S. racimigera	00000	00020	20211	01120	00001	1001
S. pauciflora	00010	00?20	20211	01120	00011	1001
S. oppositifolia	00000	10100	01000	01030	01001	111
S. hookeri	20000	10110	00100	00030	01010	211
S. ramosissima	20000	10110	00100	00021	01010	211
S. pilosa	20000	10110	00100	01021	01010	211
S. tenuifolia	20000	10110	00110	10121	01010	111
S. striata	20000	10110	00100	01021	01010	211
S. restiacea	20110	10010	10210	01020	01010	211
S. chrysopogon	20110	10110	10210	01020	01000	211
S. oxyclona	20010	10010	10110	01020	01000	211
S. hamiltonii	20110	10110	10110	01120	01000	211
S. tortuosa	20110	10110	10200	01120	00000	211
S. basedowii	20110	10110	10200	11130	01000	211
S. parvifolia	20010	10110	10210	01130	01000	211
S. depauperata	20110	10110	10200	11130	01000	211
S. angulata	20110	10010	00010	01130	00100	210
S. pulchella	20000	10120	10111	01120	00100	211
S. collaris	20000	00020	00211	00020	00200	210
S. crassifolia	01000	00220	20111	20120	00200	100
S. angustata	01000	00220	20111	21120	00200	200
S. nitida	01000	10220	20111	21120	00200	100
S. thesioides	11000	10220	20111	21120	00200	100
S. globulifera	11000	00220	10111	21120	00100	210
S. porocarya	01000	00220	10111	21120	00100	000
S. cunninghamii	01000	10220	10101	21120	00100	100
S. browniana	10000	10120	10111	21120	10100	210
S. revoluta	11000	10120	21111	20120	10100	210
S. macrostachya	10000	10020	11111	20120	00100	210
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S. lanceolata	20000	10120	20111	21120	00100	210
S. virgata	20000	10120	20011	20120	00100	210
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S. calendulacea	20000	10120	10111	21120	10001	210
S. canescens	20000	10121	10111	20130	10100	311
S. sericophylla	00000	10121	10111	20130	10100	310
S. repens	20000	10121	10111	21130	10100	310
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S. linearis	20000	10121	10111	20120	10100	311
S. humifusa	20000	10021	10111	01120	10100	310
S. albida	20000	10020	00111	01120	12010	311
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S. glabrata	20000	00020	00111	11130	02010	211
S. glutinosa	20001	10120	00111	21130	02000	211
S. densifolia	20000	10120	00111	11130	01000	211

S. cuneifolia	20000	10120	00010	01120	01000	211
S. aemula	20000	10120	00011	01130	01000	211
S. graminea	20000	00020	00011	01130	01000	211
S. laciniata	20000	00120	00011	11130	01000	211
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Nomenclatural notes and new taxa in the genus *Goodenia* (Goodeniaceae)

Roger Carolin

Abstract

Carolin, Roger (John Ray Herbarium, University of Sydney, Australia 2006). 1990. Nomenclatural notes and new taxa in the genus Goodenia *(Goodeniaceae). Telopea 3(4):517-570.* — Lectotypifications of a number of taxa in *Goodenia* are made and discussions of holotypes provided where necessary. The genera *Calogyne, Catospermum, Neogoodenia* and *Symphyobasis* are reduced to synonyms of *Goodenia* and the necessary new combinations are made. Forty-three taxa are described as new, i.e., *G. arachnoidea, G. arenicola, G. argillacea, G. bellidifolia* subsp. *argentea, G. berringbinensis, G. byrnesii, G. campestris, G. convexa, G. chthonocephala, G. delicata, G. drummondii, G. durackiana, G. fordiana, G. glareicola, G. gloeophylla, G. heterophylla* subsp. *eglandulosa, G. heterophylla* subsp. *montana, G. integerrima, G. janamba, G. kakadu, G. kingiana, G. leiosperma, G. lyrata, G. macbarronii, G. malvina, G. muelleriana, G. nigrescens, G. ochracea, G. pallida, G. paludicola, G. pascua, G. potamica, G. perryi* Gardner ex Carolin, *G. phillipsiae, G. prostrata, G. racemosa* var. *latifolia, G. redacta, G. sepalosa* var. *glandulosa, G. tripartita, G. viridula, G. viscidula, G. watsonii* subsp. *glandulosa, G. willisiana.* The rank of three taxa is changed, i.e., *G. brachypoda* (F. Muell.) Carolin, *G. hederacea* subsp. *alpestris* (Krause) Carolin, *G. heterophylla* subsp. *teucriifolia* (F. Muell.) Carolin. Sixteen new combinations are made as follows. Transferred from *Calogyne*: *G. heteroptera* (F. Muell.) Carolin, *G. heppleana* (W. Fitzg.) Carolin, *G. holtzeana* (Specht) Carolin, *G. neglecta* (Carolin) Carolin, *G. pilosa* (R. Br.) Carolin, *G. porphyrea* (Carolin) Carolin, *G. purpurea* (F. Muell.) Carolin, *G. quadrifida* (Carolin) Carolin, *G. symonii* (Carolin) Carolin. Transferred from *Catospermum: G. goodeniacea* (F. Muell.) Carolin. Transferred from *Scaevola: G. helmsii* (E. Pritzel) Carolin, *G. fasciculata* (Benth.) Carolin. Transferred from *Neogoodenia*, with a new specific epithet: *G. neogoodenia* Carolin. Transferred from *Symphyobasis*: *G. macroplectra* (F. Muell.) Carolin. Transferred from *Velleia*: *G. cusackiana* (F. Muell.) Carolin, *G. salmoniana* (F. Muell.) Carolin. A new name, *G. krauseana*, is provided for *G. nana* K. Krause non Vriese. The name *G. micrantha* Hemsley is validated.

Introduction

This is the third in a series of contributions which provide a basis for the taxonomic treatment of the family Goodeniaceae in the Flora of Australia, vol. 35. Previous ones have dealt with the taxonomy, phylogeny, nomenclature and new taxa in *Dampiera* (Rajput and Carolin 1988) and *Scaevola* (Carolin 1990). The present one deals only with the nomenclature and new taxa in the genus *Goodenia*. A contribution is being prepared which will consider the phylogeny and taxonomy of *Goodenia* and its satellite genera. Most of the preliminary analyses have been carried out but it is necessary to formalise the proposed taxonomic changes before these aspects can be submitted for publication in order that the Flora of Australia vol. 35 may proceed.

If *Calogyne, Catosperma, Neogoodenia* and *Symphyobasis* are accepted at generic level, the genus *Goodenia* is rendered paraphyletic (Carolin, unpub.). Consequently they are here reduced to synonyms of *Goodenia*. The status of the genus *Selliera* remains ambiguous after the analyses, and consequently it is retained for the time being.

Carolin (1967) provides a diagram which illustrates the terms used in describing the parts of the corolla.

The structure of this contribution is similar to the second part of the papers on *Dampiera* and *Scaevola*. Argument is provided by Rajput and Carolin (1988) for the selection of various types in the case of collections by R. Brown, L. Preiss, and E. Pritzel. Paralectotypes are given when more than one collection relates to the protologue. The asterisk, '*', indicates that only one collection relates to the protologue. The Guide to the Determination of Types in the International Code of Botanical Nomenclature has been followed to avoid possible arbitrary selection of lectotypes.

When a name is considered to be a synonym of another name, the name that is currently accepted is given after '='.

When selected specimens are cited, the total number examined is indicated in parentheses.

The taxa are arranged in a supposedly natural sequence.

G. scapigera *R. Br.*, Prodr.: 578 (1810).

LECTOTYPE: WESTERN AUSTRALIA: Bay I (Lucky Bay), *R. Brown*, 11 Jan. 1802 (BM). ISOLECTOTYPE: K.* Brown recognised two variants 'α' and 'β'. Both of these are represented on one sheet at BM although Brown has labelled none of the specimens as either α or β. Instead, the ones corresponding to β are labelled *'G. affinis'* and the others *'G. scapigera'*. It seems clear from this that one must select the specimen labelled *'G. scapigera'* by Brown as the lectotype and which he subsequently described as 'α'. β is conspecific with *G. decursiva*.

G. scapigera var. *foliosa* F. Muell. ex Benth., Fl. Austral. 4: 57 (1868) = **G. decursiva** *W. Fitzg.*

LECTOTYPE: WESTERN AUSTRALIA: Cape Arid and Cape Le Grand, *Maxwell* (K). The specimen second from the left on this sheet of mixed collections is selected.

G. decursiva *W. Fitzg.*, West Australian Natural History Society 2: 25 (1905).

LECTOTYPE: WESTERN AUSTRALIA: Esperance, *C. Andrews*, Oct. 1903 (PERTH). ISOLECTOTYPES: K, NSW 76592, PERTH.* There are two sheets at PERTH, both bearing the same label. One I have marked as the lectotype.

G. watsonii *F. Muell. & Tate*, Trans. Roy. Soc. South Australia 16: 371 (1892) (as *G. watsoni*).

LECTOTYPE: WESTERN AUSTRALIA: near Gnarlbine, *R. Helms*, 12 Nov. 1891. Elder Expl. Exped. (MEL 22128). ISOLECTOTYPES: AD 96620133, K, MEL 22129, 22130, NSW 80794, 76581.*

G. watsonii subsp. glandulosa *Carolin*, **subsp. nov.**

Sepala et corolla extus glandulosa. Thyrsus laxus. Pedunculi pedicelli, ovaria, sepala ac extus corollae glandulose pubescentes. Corolla plerumque 4–5 mm longa, coerulea faucis flavis. Ovulae 12–16.

HOLOTYPE: WESTERN AUSTRALIA: 20 miles East of Hyden, *J.S. Beard 3908*, 12 Jan. 1965 (PERTH).

This differs from the type subspecies as follows: Thyrses loose. Peduncles, pedicels and outside of flowers glandular pubescent. Corolla usually 4–5 mm long, blue, with yellow throat. Ovules 12–16.

RANGE: Lake Grace–Hyden region in Western Australia.

HABITAT: Open woodland.

SPECIMENS EXAMINED: WESTERN AUSTRALIA: 8 miles (12.8 km) W of Lake Grace, *A.S. George 520*, 30 Jan. 1960 (PERTH); 16 miles (25.6 km) W of Lake Grace, *W.E. Blackall 1314*, 11 Nov. 1931 (PERTH); 12 miles (19.2 km) north of Lake Grace, *P.R. Jefferies 641029*, Oct. 1964 (PERTH).

The subspecific epithet refers to the glandular hairs on the inflorescence.

G. pinifolia *Vriese*, Natuurk. Verh. Holl. Maatsch. Wetensch. Haarlem ser. 2 10: 157 (1854).

LECTOTYPE: WESTERN AUSTRALIA: Ad flumen cygnorum, *Drummond*, 1839 (K). ISOLECTOTYPE: MEL 22082. Vriese writes 'Herb. Hook et Lindley'. The former specimen has been selected as the lectotype.*

G. fasciculata (*Benth.*) *Carolin*, **comb. nov.**

BASIONYM: *Scaevola fasciculata* Benth. in Endl., Enum. Pl. Hueg.: 68 (1837).

HOLOTYPE: WESTERN AUSTRALIA: Swan River, *Huegel* (W).

G. squarrosa Vriese in J.G.C. Lehmann, Pl. Preiss. 1: 413 (1844) = **G. fasciculata** *(Benth.) Carolin.*

LECTOTYPE: Maddington, *L. Preiss 1467*, 2 Nov. 1839 (LD). ISOLECTOTYPE: K, MEL.*

G. drummondii *Carolin*, **sp. nov.**

Frutex erectus ad 1 m altus. Folia crassa, linearia vel anguste obovata 1–4 cm longa integra vel dentata sessilia glabra. Folia lateralia fasciculata in axilis foliorum in caule principali. Flores pedunculis bracteolatis brevissimis. Corolla alba signis purpurascentibus c. 6 mm longa glabra extus lobis ± aequalis palmatis alatis anguste. Ovulum unicum. Stylus 3.5 mm longus pilis purpureis pallide obtectus. Indusium oblongum. Nux globula c. 1 mm diametro.

HOLOTYPE: WESTERN AUSTRALIA: *Drummond s.n.* (MEL 21907). SUPPOSED ISOTYPES: MEL 21902, 21905, 21907, 21899.

Erect glabrous shrub to 1 m. *Stems* slightly branched, echinate with persistent leaf-bases. *Leaves* thick, tending to form axillary fascicles, linear to very narrow-obovate, 1–4 cm long, 1–4 mm wide, sessile, acute, entire or with few narrow teeth, with few very short axillary hairs. *Flowers* in terminal and axillary spike-like thyrses to 20 cm long; bracts linear-triangular, 1–2 mm long, acute; bracteoles similar but smaller. *Sepals* narrow-ovate to almost linear, 1–1.5 mm long, 0.4–0.5 mm wide, acute, entire, wholly adnate to ovary only at base and above that by median line only for about ⅔ its length. *Corolla* white with purplish markings at base of lobes, c. 6 mm long, glabrous outside, sprinkled with stiff white simple hairs inside especially on veins, without auricles; anterior pocket obscure, c. ½ as long as ovary; tube c. 2.8 mm long; lobes almost equal, narrow-ovate to narrow-elliptic, 2.5 mm long, 0.5 mm wide; wings 0.3–0.4 mm wide; connate part of inferior lobes 0.3–0.4 mm long. *Stamen* filaments linear, c. 4 mm long; anthers narrow-oblong, c. 1 mm long. *Ovary* septum minute; ovule solitary, erect; style 3.5 mm long, geniculate, with short stiff purplish simple hairs and some minute glandular ones; indusium oblong, c. 1 mm long, pale brown, not folded, glabrous or with a few hairs at base, with a ± straight orifice beset with minute bristles. *Fruit* an inferior nut, globular c. 1 mm diam., glabrous except for prominent pubescent beak. *Seed* ± compressed, brownish, ellipsoid, c. 1 mm long, smooth; rim and wing obsolete.

RANGE: Austin and Irwin Regions in Western Australia.

HABITAT: Woodlands and heaths on sandy soils.

DISCUSSION: This species was previously included under *G. stenophylla* (as *Scaevola stenophylla*) from which it differs in its smaller flowers with narrower corolla wings, narrower sepals, consistently a single ovule in the ovary and the considerably broader and frequently dentate leaves. It is also separated from *G. stenophylla* by a very considerable geographic discontinuity. In fact, it is more closely related to *G. helmsii*, from which it differs in the larger leaves.

SELECTED SPECIMENS (15): WESTERN AUSTRALIA: Latham, *D.A. Sargent 1372*, 23 Oct. 1921 (MEL 21908); 2 miles (3.2 km) along Balla Road from Geraldton–Carnarvon Hwy., *A.C. Burns 1070*, 30 Oct. 1966 (PERTH); 27 miles (43.2 km) E of Kalbarri, *A.S. George 7926*, 8 Sept. 1966 (PERTH); Moresby Range, *A.C. Burns 6*, 19 Sept. 1965 (PERTH); *Drummond 365* (MEL 21900, 21898, K).

Named for the collector of the type specimen, James Drummond, a famous collector of plants in Western Australia in the last century.

G. helmsii (*E. Pritzel*) *Carolin*, **comb. nov.**

BASIONYM: *Scaevola helmsii* E. Pritzel, Bot. Jahrb. Syst. 35: 572 (1905).

LECTOTYPE: WESTERN AUSTRALIA: In distr. Coolgardie haud procul Southern Cross, *E. Pritzel 881* (NSW 76565). ISOLECTOTYPES: B (destroyed), K. PARALECTOTYPES: In distr. Avon interiore prope Tammin, *Diels 2866* (B destroyed); In distr. Coolgardie haud procul Southern Cross, *Diels 5591* (B destroyed).

G. viscida *R. Br.*, Prodr.: 578 (1810).

LECTOTYPE: WESTERN AUSTRALIA: Bay 1, orae australis Nova Hollandia, *R. Brown*, 12 Jan. 1802 (BM). ISOLECTOTYPE: K*.

G. acuminata R. Br., Prodr.: 546 (1810) = **G. ovata** *Sm.*

LECTOTYPE: NEW SOUTH WALES: Grose River, *R. Brown*, 1803 (BM). ISOLECTOTYPES: K, MEL.*

G. varia *R. Br.*, Prodr.: 576 (1810).

LECTOTYPE: SOUTH AUSTRALIA: Bay III S. Coast, *R. Brown*, s.d. (BM). ISOLECTOTYPES: K, MEL.*

G. mollis R. Br., Prodr.: 577 (1810) = **G. grandiflora** *Sims*

LECTOTYPE: QUEENSLAND: In monte prope Upper Lead, Broad Sound, *R. Brown*, s.d. (BM). ISOLECTOTYPES: K, MEL.*

G. horniana *F. Muell. & Tate ex Tate* in Spencer, Report on the work of the Horn Scientific Exploring Expedition to Central Australia 3: 189 (1896).

LECTOTYPE: NORTHERN TERRITORY: George Gills Range, *R. Tate*, June 1894 (AD 97601116). ISOLECTOTYPES: MEL 23313, 23050, 23049, K.* Mueller and Tate mention the binomial in Trans. & Proc. Roy. Soc. South Australia 19: 82 (1895), but no description is supplied. The name was first published with a description by Tate himself as indicated. It is likely that all the specimens were available to the authors when they cast their description.

G. chambersii *F. Muell.*, Fragm. 1: 204 (1859).

LECTOTYPE: SOUTH AUSTRALIA: North western South Australia, *J. M'Douall* [sic] *Stuart* (MEL). ISOLECTOTYPE: K. There has been some confusion, probably introduced by Bentham, over the type of this species. He cites 'J. M'douall Stuart's' specimen from Mt Freeling under both *G. grandiflora* and *G. chambersii*. This specimen has no connection with Mueller's original description of *G. chambersii*. Mueller himself, in fact, identified

it as *G. grandiflora* (MEL 23113). Since Mueller's original description of *G. chambersii* was published in 1859, it must be related to specimens collected before that date. Unfortunately, none of Stuart's specimens are dated. However, he did not reach Mt Freeling, in the Reynolds Range, until April 1860. Any specimens from this locality can, therefore, have no significance here. The specimens from north-western South Australia, labelled *'G. chambersii'* by Mueller, must be the authentic ones used by him. Before 1859 Stuart had made only one well-documented journey into the north-west of S. Australia. It is unlikely that he did much travelling west of Lake Torrens previously. This first journey was completed in late 1858 and it was probably during this that the specimens were collected, possibly in the ranges to the west of the Lake Eyre Basin.

G. kingiana *Carolin*, **sp. nov.**

Herba erecta suffruticosa vel frutex parvus usque 1.5 m altus. Folia lyrato-pinnatifida; lamina principalis ovata cordata grosse dentata pilis glandulosis et brevissimis simplicibus obtecta; pinnae laterales ovatae vel lineares petiolulatae. Flores pedunculis bracteolatis pedicellisque articulatis in racemis terminalibus dispositi. Corolla flava 2.5–3 mm longa glanduloso-pubescens extus et seriebus enationum prominentibus intus. Ovarium glanduloso-pubescens. Fructus late ovoideus 8 mm longum duabus valvis dehiscens.

HOLOTYPE: WESTERN AUSTRALIA: 16 miles (25.6 km) E of Kalli, *N.H. Speck 1052*, 22 July 1958 (CANB 109430). ISOTYPES: AD 96003018, BRI 020575, K.

Erect, viscid, suffruticose plant or undershrub to 1.5 m high. *Stems* ridged when young but becoming ± teretc, pubescent with both long and short glandular hairs but scarcely any simple hairs. *Leaves* lyrate-pinnate; terminal lamina ovate, 2–4 cm long, 1–2.5 cm wide, cordate at base, acute, coarsely dentate, glandular-pubescent with long and short hairs but also with a very short simple pubescence; lateral pinnae much smaller, ovate to linear, when ovate always distinctly petiolulate; petiole 3–7 cm long, slender. *Flowers* in terminal leafy racemes, rarely thyrses; peduncles 3-10 mm long, glandular-pubescent; bracteoles linear to oblanceolate or narrow-elliptic, 5-10 mm long, 1–1.5 mm wide, acute, entire or with a few lobes at base, usually ± petiolate, glandular-pubescent; pedicel 15–20 mm long, similar to peduncle, articulate just below ovary. *Sepals* lanceolate, 4–5 mm long, c. 1.0 mm wide, acute, entire, glandular-pubescent, adnate to ovary nearly to its summit. *Corolla* yellow, 2.5–3 cm long, glandular-pubescent with a few short simple hairs outside, villous-hirsute towards base, with rows of very prominent enations inside, scarcely auriculate; anterior pocket ± prominent, c. ⅔ as long as ovary; tube 5–6 mm long; superior lobes narrow-oblong, c. 2 cm long, 3–4 mm wide; inferior lobes oblong-elliptic, 14–16 mm long, 5–6 mm wide, central one slightly broader than laterals; wings 3–4 mm wide; connate part of inferior lobes 10–12 mm long. *Stamen* filaments linear, 8–9 mm long; anthers narrow-oblong, 3.5 mm long, 0.8 mm wide. *Ovary* glandular-pubescent; septum about ⅔ as long as loculus; ovules 20–26; style c. 25 mm long, sparsely villous; indusium depressed-ovate, 3 mm long, 6 mm wide, yellow-brown, ± concave, with a slightly curved orifice beset with white bristles c. 0.5 mm long. *Fruit* broad-ovoid, 8 mm long, 6 mm wide, glandular-pubescent, with a distinct beak, 2-valved probably to base at maturity, each valve not or only shortly bifid. *Seeds* flat, only immature ones seen.

RANGE: Austin Region in Western Australia.

HABITAT: Feet of lateritic "breakaways".

DISCUSSION: This species differs from *G. grandiflora* and its closer relatives in the longer glandular hairs, the larger flowers with broader wings making a more

acute angle at the apex, and the petiolulate segments below the main lamina of the leaf.

Specimens Examined: Western Australia: 43 miles (68.8 km) SE of Mileura, *N.H. Speck 696*, 7 Sept. 1957 (CANB 109429); 60 km NW of Cue, *P.G. Wilson 9901*, 1 Sept. 1970 (PERTH); Near Lake Austin, *H.S. King*, 1886 (MEL 23909, MEL 23091); Tching Range, *W.J. Peacock 60858.1*, 15 Aug. 1960 (SYD); Cue, *W.D. Campbell*, June 1902 (K); 3 miles (4.8 km) E of Cue, *C.A. Gardner*, 28 July 1927 (K).

Named in honour of H.S. King who first collected this species.

G. amplexans *F. Muell.*, Trans. & Proc. Philos. Inst. Victoria 2: 70 (1858).

Lectotype: South Australia: Foot of the Mount Lofty Ranges (MEL 23844). Paralectotypes: Banks of the Torrens River, *F. Mueller*, Jan. 1848 (MEL22300); Nile Rivulet, *s.c.*, Nov. 1848 (MEL 23854). In the protologue Mueller gives as locality "Ridges and gullies near Adelaide". There are no specimens labelled in that way and the one selected as the lectotype is the only one collected in the area in question and annotated by Mueller with the name *Goodenia amplexans*.

G. fordiana *Carolin*, **sp. nov.**

Herba prostrata pubescens confertim molliter pilis simplicibus pro parte maxima induta. Scapi usque 20 cm longi in axillis foliorum rosulatorum inserti. Folia rosulata distincte petiolata: lamina elliptica vel late elliptica 10–25 mm longa 8–14 mm lata obscure dentata. Flores distantes pedicellis non articulatis, 1–1.5 cm longis in racemis foliosis dispositi. Corolla flava 8-10 mm longa seriebus enatiorum intus. Indusium transverse ellipticum. Fructus et semina non videntur.

Holotype: New South Wales: Bushman Range near Coramba, *W. Heron*, Oct. 1913 (NSW 76620).

Prostrate herb, pubescent with soft simple and multicellular hairs, with a thin tap root and a distinct persistent rosette of leaves in axils of which arise leafy scapes to 20 cm long. Basal leaves narrowing abruptly into a ± distinct petiole 1–3 cm long; lamina elliptic to broad-elliptic, 10–25 mm long, 8–14 mm wide, obscurely dentate to entire, obtuse, softly pubescent with mostly simple hairs on both surfaces, denser on lower surface; cauline leaves smaller. *Flowers* distant in leafy racemes; peduncles 1–2 cm long, pubescent; bracteoles linear, 2 mm long, 0.2 mm wide, acute, pubescent; pedicels 1–1.5 cm long, similar to peduncles, not articulate. *Sepals* linear, 2.5 mm long, 0.5 mm wide, acute, pubescent, adnate to ovary almost to its summit. *Corolla* yellow, 8-10 mm long, pubescent with soft mostly simple hairs outside, ± pubescent inside towards base, with rows of distinct enations, auriculate; anterior pocket less than ½ as long as ovary; tube 1.5 mm long; superior lobes narrow-oblanceolate, 5 mm long, 1 mm wide; inferior lobes elliptic, c. 3.5 mm long, 1.5 mm wide; wings 2 mm wide; connate part of inferior lobes c. 4 mm long. *Stamen* filaments linear, c. 1.5 mm long; anthers broad-elliptic, 0.5 mm long, with a short broad mucro. *Ovary* pubescent; septum c. ½ as long as loculus; ovules 24–28; indusium transverse-elliptic, 0.7 mm long, 1.2 mm wide, scarcely folded, villous-pubescent, with a curved orifice beset with white bristles c. 0.1 mm long on both lips. *Fruit* and seed not known.

Range: North Coast District of New South Wales.

Habitat: Forests and woodlands.

Discussion: In some respects this species resembles *G. rotundifolia*, from which it can be distinguished by the softer pubescence, longer pedicels, more slender scapes with long internodes and the almost entire leaves.

SPECIMENS EXAMINED: NEW SOUTH WALES: North Coast: Lookout Road, Bellangry State Forest, *J.C. Cousins*, 23 Oct. 1958 (NSW 76619); Bulahdelah, *H.M.R. Rupp*, 12 Nov. 1923 (NSW 76621).

Named for Neridah Ford formerly of the National Herbarium of N.S.W. who first recognized this species and kindly drew my attention to it.

G. taylorii F. Muell. (as *G. taylori*), Fragm. 3: 141 (1862) = **G. quadrilocularis** *R. Br.*

LECTOTYPE: WESTERN AUSTRALIA: Orleans Bay, (*Maxwell?*) (MEL 22084). POSSIBLE ISOLECTOTYPE: K.* There is some confusion about the type of *G. taylorii* F. Muell. and the specimen which Mueller cites in Fragm. 6: 13 (1867) as *G. quadrilocularis*. The locality given for these two specimens in each case refers to '. . .in collibus arenosis . . . Orleans Bay'. The descriptions are really very similar in important features, allowing for the fact that they were drawn up at different times.
There is only one specimen agreeing with these descriptions, collected in sand hills at Orleans Bay and housed in MEL. It is labelled '*G. quadrilocularis R. Br*'. Since this agrees with the description of *G. taylorii*, particularly with regard to the indumentum of the corolla, shape of the capsule and of the leaf, I am selecting this as the lectotype. It appears that Mueller (Fragm. 6: 13) used both this specimen and 'Towards the Great Bight' (MEL 22083), in casting his later description of *G. quadrilocularis*.
I have been unable to find any specimen at MEL, or elsewhere, labelled *'G. taylori'*.

G. decurrens *R. Br.*, Prodr.: 575 (1810).

LECTOTYPE: NEW SOUTH WALES: Banks of Grose River, *R. Brown*, 1803 (BM). ISOLECTOTYPES: K, MEL, P.*

G. dimorpha *Maiden & Betche*, Proc. Linn. Soc. New South Wales 28: 907 (1904).

LECTOTYPE: NEW SOUTH WALES: Woodford, Blue Mts., *J.H. Maiden*, Jan. 1899 (NSW); ISOLECTOTYPE: MEL. PARALECTOTYPES: Springwood, Blue Mountains, *E. Betche*, Feb. 1884 (NSW); Blackheath, Blue Mountains, *A.A. Hamilton*, Jan. & April, 1900 (MEL, NSW).

G. dimorpha var. **angustifolia** *Maiden & Betche*, Proc. Linn. Soc. New South Wales 28: 907 (1904).

LECTOTYPE: NEW SOUTH WALES: National Park, *J.L. Boorman*, Jan. 1903 (NSW). PARALECTOTYPE: National Park, *J.L. Boorman*, Jan. 1903 (NSW).

G. stelligera *R. Br.*, Prodr.: 575 (1810).

LECTOTYPE: NEW SOUTH WALES: Port Jackson (inter Sydney & South Head), *R. Brown*, May-June 1802 (BM). ISOLECTOTYPES: K, MEL, P.

G. rostrivalvis *Domin*, Biblioth. Bot. 22: 1193 (1929).

LECTOTYPE: NEW SOUTH WALES: Sandsteinhugel in dem Blue Mountains bei Katoomba, *Domin*, April 1910 *Domin* (PR). PARALECTOTYPE: ohne nahere Standortsangabe, *A. Cunningham* (K).

G. bellidifolia var. *ramosissima* K. Krause, Pflanzenr. 54: 50 (1912). = **G. bellidifolia** *Sm. subsp.* bellidifolia.

HOLOTYPE: NEW SOUTH WALES: ohne genauen Standorts, *Caley* (B, destroyed). LECTOTYPE: The former isotype at BM. ISOLECTOTYPE: W.

G. bellidifolia subsp. **argentea** *Carolin*, **subsp. nov.**

Folia ovata in petiolum gradatim decrescentes. Corolla villosa albide gossypine extus. Stylus plerumque glaber indusio plerumque oblongo 1 mm longo 0.6 mm

lato bicanaliculato infra setis super labio 0.2 mm longis. Capsula globula c. 2 mm diametro.

HOLOTYPE: NEW SOUTH WALES: 18 miles west of Emmaville, *W.J. Peacock* 6111.23.1, s.d. (NSW).

Perennial with a basal stock. *Leaves* in an ascending rosette, usually ovate, narrowing gradually into a short petiole. *Corolla* with few short appressed yellow hairs, which are scarcely visible without a x10 magnification, and numerous multicellular cottony hairs on outside. *Style* usually glabrous but for a few villous hairs towards top; indusium oblong or rarely slightly obovate, 1.0 mm long, c. 0.6 mm wide with a double groove and a single usually villous ridge below; indusium bristles usually less than 0.2 mm long. *Fruit* globular to subglobular, c. 2.0 mm diam. Seeds very dark brown to black.

RANGE: Northern parts of the Western Slopes, Tablelands and Coastal Districts of New South Wales; Darling Downs, Moreton and Widc Bay Districts of Queensland.

HABITAT: Grassland, scrubs and woodlands.

DISCUSSION: See Peacock (1962).

SELECTED SPECIMENS (106): NEW SOUTH WALES: Maryland, *E. Hickey 101*, Dec. 1884 (MEL 22017); Wallangarra, *J.L. Boorman*, Nov. 1912 (NSW 76795); Jennings, *J.L. Boorman*, Dec. 1903 (NSW 76810); Lookout Point, near Inverell, *P.B. Oelrich AR921*, 28 March 1950 (CANB 79360); Ben Lomond, *R.A. Boyd*, 25 Jan. 1955 (AD 95809061); 3 miles (4.8 km) N. of Bundarra, *W.J. Peacock 6111.14.1*, s.d. (SYD); Barcoongere SF., *W.J. Peacock 6012.2.5*, 10 Dec. 1960 (SYD); Laurieton, *J.L. Boorman*, Nov. 1915 (NSW 76503).

Named for the silvery hairs on the corolla; Latin, *argenteus* = silvcry.

G. racemosa *F. Muell.*, Fragm. 1: 114 (1859).

LECTOTYPE: QUEENSLAND: Burnett River, *F. Mueller*, Nov. 1856 (MEL). ISOLECTOTYPES: K, MEL.

G. racemosa var. **latifolia** *Carolin*, **var. nov.**

Folia anguste oblonga. Corolla alis angulatis acute. Indusium depresse ovatum.

HOLOTYPE: QUEENSLAND: Isla Gorge, 16 miles (25.6 km) SSW of Theodore, *F. D. Hockings 11*, 1 Sept. 1963 (BRI 045529).

Differs from the type variety as follows: Leaves narrow-oblong, 7–10 mm wide. Corolla wings with ± acute angles, c. 1.6 mm wide; auricles conspicuous, pubescent; inferior lobes c. 5 mm long. Indusium depressed-ovate.

RANGE: Leichhardt District of Queensland.

HABITAT: Rocky situations.

SPECIMEN EXAMINED: QUEENSLAND: Isla Gorge, *S. L. Everist 8060*, 28 Sept. 1968 (BRI 151669).

Named for the leaves which are wider than those of the type variety. Latin, *latus* = wide, *folium* = leaf.

G. disperma *F. Muell.*, Fragm. 1: 113 (1859).

LECTOTYPE: QUEENSLAND: Dawson River (MEL). ISOLECTOTYPE: K. PARALECTOTYPES: Uncertain. Mueller writes in the protologue, 'Inter campis sub-arenosis ad pedes montium inter flumina MacKenzie, Dawson, et Burnett'. I have not located any specimens from the Mackenzie or Burnett Rivers in MEL.

G. sessiliflora F. Muell., Fragm. 4: 145 (1864) = **G. disperma** *F. Muell.* LECTOTYPE: QUEENSLAND: Cape River, *Bowman 231* (MEL 24292). PARALECTOTYPE: Cape River, *Bowman 287*. Only these two specimens agree with the locality and collector given in the protologue; Mueller gives no numbers. Both agree with the description in the protologue and the most complete specimen has here been chosen.

G. viridula *Carolin*, **sp. nov.**

Frutex ascendens ramificatus usque 40 cm altus. Caules tomenti denso albido vel flavo-albido pilis multicellularis gossypine obtecti. Folia linearia ubi juvenilia tomentosa gossypine marginibus revolutis. Flores sessiles in spicis terminalibus dispositi. Corolla viridula c. 4.5 mm longa gossypine extus pubescens dense in fauce intus saeco obsoleto. Capsula subglobosa 3 mm lata seminibus duobus oblongo-ellipticis c. 3 mm latis ora prominenti sed ala angusta.

HOLOTYPE: QUEENSLAND: c. 5 miles (8 km) east of Jericho, *L.S. Smith & S.L. Everist 97842*, Oct. 1940 (BRI 067478). ISOTYPES: CANB 12903, MEL 22355, K).

Ascending much-branched undershrub to 40 cm. *Stems* obscurely ridged when young but becoming terete, covered with a dense white or yellowish white cottony tomentum of multicellular hairs. *Leaves* linear, 1.5–5 cm long, 0.5–1.1 mm long, cottony tomentose when young, sessile, acute, entire, margins revolute but often becoming flatter towards tips, glabrescent, with a dense tuft of villous axillary hairs. *Flowers* sessile, in ± terminal spikes; braeteoles linear, to 2 mm long. *Sepals* triangular to ovate, 0.8–1 mm long, c. 0.5 mm wide, acute, entire, sprinkled with cottony hairs, united to ovary nearly to its summit. *Corolla* greenish yellow, 4–9 mm long, sprinkled with multicellular cottony hairs on outside, densely villous in throat, auriculate; anterior pocket very short and obscure; tube 1–2 mm long; superior lobes narrow-oblong, 2–2.5 mm long, c. 0.5 mm wide; inferior lobes ovate, 2–4 mm long, 1 mm wide; wings 0.5 mm wide; connate part of inferior petals 1.5–2.5 mm long. *Stamen* filaments linear, c. 1.5 mm long; anthers oblong, c. 0.5 mm long. *Ovary* cottony-tomentose; septum scarcely ½ as long as loculus; ovules 4–6; style 1.2–1.5 mm long, ± villous towards base; indusium oblong, 1 mm long, 0.7 mm wide, brownish, not folded, with a very curved orifice beset with white bristles c. 0.3 mm long on upper lip and much shorter ones on lower lip; upper lip distinctly longer than lower one. *Fruit* subglobular, c. 3 mm diam., cottony-tomentose but for almost glabrous beak, 2-valved. *Seed* flat, yellow-brown, oblong-elliptic, c. 3 mm long, 1 mm wide, reticulate, with a prominent rim; wing narrow.

RANGE: South Kennedy and Mitchell Districts of Queensland.

HABITAT: Open woodlands and heaths.

DISCUSSION: This differs from *G. disperma* in the densely tomentose stems, linear revolute leaves and the smaller and greenish yellow flowers.

SPECIMEN EXAMINED: QUEENSLAND: Jericho, *M.S. Clemens*, April 1946 (BRI 067376).

Named for the greenish yellow corolla. Latin, *viridulus* = greenish.

G. delicata *Carolin*, **sp. nov.**

Herbae ascendentes vel decumbentes radice tenui, sparsim araehno-pubescentes pilis multicellularibus saepe glabrescentes. Caules scapique usque 50 cm longi. Folia linearia usque anguste elliptica, 2–6 cm longa, 2–6(–13) mm lata integra vel dentibus paucis grossis versus basin sensim in petiolum indistinctum contracta. Flores in racemis foliosis dispositi; bracteolae lineares; pedicelli non articulati. Corolla flava sine enationibus, 10–13 mm longa; alis

1–1.5 mm latis; lobi superiores auriculati. Fructus globularis c. 8 mm diametro duabus valvis bifidis dehiscens. Semina plana, elliptico-oblonga reticulata ora crassa sed ala angustissima.

HOLOTYPE: QUEENSLAND: 13 miles (20.8 km) W of Westmar, *L. Pedley 506*, 15 Oct. 1959 (BRI 026704).

Ascending to decumbent, short-lived herb with thin tap root. *Stems* terete, condensed or elongated, with an indistinct rosette of leaves, with scapes to 50 mm long, arachnoid-pubescent when young but glabrescent. *Leaves* linear to narrow-elliptic, 2–6 cm long, 2–13 mm wide, narrowing very gradually into an indistinct petiole, acute, entire or with few coarse teeth, slightly recurved or slightly thickened at margin, sparsely arachnoid-pubescent with multicellular and sometimes simple hairs when young, often glabrescent especially above. *Flowers* in leafy racemes; peduncles slender, mostly 5–20 mm long, sparsely arachnoid and simple-pubescent to almost glabrous; bracteoles linear, 1–2 mm long, c. 0.5 mm wide, acute, pubescent to glabrescent; pedicels 5-10 mm long, not articulate, similar to peduncles. *Sepals* linear-ovate, 2–2.5 mm long, c. 0.5 mm wide, acute, sparsely arachnoid and simple-pubescent to almost glabrous, adnate to ovary nearly to its summit. *Corolla* yellow, 10–13 mm long, sparsely arachnoid-pubescent with multicellular hairs and some simple ones on outside often more numerous towards top, very sparsely pubescent towards base and without enations inside; anterior pocket almost obsolete; tube 4–5 mm long; superior lobes falcate-narrow-elliptic, 6–7 mm long, c. 1 mm wide; inferior lobes narrow-oblong, 4–4.5 mm long, c. 1.5 mm wide; wings c. 1 mm wide; connate part of inferior lobes 6–7 mm long. *Stamen* filaments linear, 3 mm long; anthers linear, 1.5 mm long, minutely apiculate. *Ovary* sparsely arachnoid and simple-pubescent; septum c. ½ as long as loculus; ovules c. 12; style 4–5 mm long, glabrous, slightly geniculate; indusium very broad-elliptic, 1 mm long, 1.5 mm wide, purple-brown, glabrous, with a very slightly concave orifice beset with white bristles c. 0.1 mm long on both lips. *Fruit* globular, c. 8 mm diam., pubescent to almost quite glabrous, with a glabrous beak, 2-valved, each valve bifid for c. ½ its length and spreading. *Seeds* flattened, pale yellow, elliptic-oblong, 2 mm long, aculeate; wing c. 0.1 mm wide.

RANGE: Western Plains of New South Wales; Darling Downs, Burnett and Wide Bay Districts of Queensland.

HABITAT: Forests and woodlands.

DISCUSSION: This species has been confused with *G. geniculata* by Bailey, Qld. Fl.: 898 (1900) etc. It differs from other species of the *G. hederacea* group in the very sparse indumentum and narrow leaves. The leaves are often almost entire. When simple hairs are present they are very short, patent and soft. The capsule is globular as compared with more elongated capsules in other members of the group.

SELECTED SPECIMENS (11): QUEENSLAND: Mt Perry, *J. Keys* (BRI 1067585, 067586); Eidsvold, *H.S. McKee 10230*, 3 April 1963 (CANB 139062); Biggenden, *C.T. White 7280*, 11 Oct. 1930 (BRI 067567, 067568); Gayndah, *G.J.E. Schoneveld 249*, 1960 (BRI 1024882); Gurulmundi, *R.W. Johnson & L. Pedley 42*, 29 June 1955 (BRI 067566); 3 miles (4.8 km) N of Glenmorgan, *W.J. Peacock 6111.36.2*, s.d. (SYD); 15 miles (24 km) N of Jackson, *R. Melville 3466*, 25 March 1953 (NSW 88354).

Named for the Darling Downs on which it occurs. Latin, *delicatus* = darling.

G. heterophylla subsp. **eglandulosa** *Carolin*, **subsp. nov.**

G. heterophylla subsp. 'B' Jacobs & Pickard, Plants of N.S.W.: 133 (1981).

Herbae ascendentes usque erectae pubescentes pilis simplicibus et multicellularibus nonnumquam glabriusculae. Folia ovata, serrata dentibus saepissime distincte mucronatis et marginibus recurvatis.

HOLOTYPE: NEW SOUTH WALES: South end of Jervis Bay, *F.A. Rodway*, Oct. 1954 (NSW 100834).

Ascending to erect herb with simple and multicellular hairs, sometimes glabrescent. *Leaves* ovate, 1–3 cm long, serrate, each tooth mucronate, sometimes with two basal lobes; margin recurved.

RANGE: Coastal Districts of New South Wales.

HABITAT: Frequently on deep sands but also on the massive sandstones of the Budawang Range near Milton. Also known from other rock formations in the Bulahdelah – Barrington Tops area.

DISCUSSION: Differs from the type subspecies in the pubescence of simple and multicellular hairs with no glandular hairs and although it is sometimes glabrescent; leaves ovate, serrate, each tooth ± mucronate, with recurved margins. The relationship of this and the type subspecies is discussed by J. Hufton (Hons. Thesis University of Sydney, 1972).

SELECTED SPECIMENS (44): NEW SOUTH WALES: Bargoongarie Forest, *W.J. Peacock 6012.2.3*, 10 Dec. 1960 (SYD); Wallis Lake, *H. Salasoo 3312*, 6 Jan. 1967 (NSW 100618); Boolambayte Lake, *J. Hufton 11*, 1972 (SYD); Alum Mt, *E.F. Constable 4294*, 26 Aug. 1963 (NSW 71139); Kogarah, *J.H. Camfield*, Nov. 1896 (NSW 81425); Lower Budgong road 3 miles (4.8 km) N of Shoalhaven River, *L.A.S. Johnson & E.F. Constable*, 24 Nov. 1960 (NSW 50178); Turpentine Range, *J. Hufton 35*, 1972 (SYD)

The epithet refers to the lack of glandular hairs which are found in the type subspecies. Latin, *e-* = without, *glandulosus* = glandular.

G. heterophylla subsp. **teucriifolia** (*F. Muell.*) *Carolin*, **comb. nov.**

BASIONYM: *G. teucriifolia* F. Muell., Trans. & Proc. Philos. Inst. Victoria 2: 70 (1858).

LECTOTYPE: QUEENSLAND: Moreton Bay, Glasshouse Mts., *s. c.* (MEL 23907). ISOLECTOTYPES: MEL 23911, 23908 pro parte, K. There are three sheets of this taxon at MEL bearing specimens from this locality; only one is annotated as 'G. heterophylla Sm. var teucriifolia'. Since this specimen agrees as closely as any of them with the original description, I am selecting it as the lectotype.

G. heterophylla subsp. **montana** *Carolin*, **subsp. nov.**

[*G. heterophylla* subsp. 'C' Jacobs & Pickard, Plants of N.S.W. 133 (1981)].

Herbae suffruticosae erectae scabridae pilis antrorsis simplicibus et partibus junioribus pubescentibus pilis multicellularibus.

HOLOTYPE: NEW SOUTH WALES: Mt Colong, *E.F. Constable*, 4 March 1948 (NSW 81462).

Differs from the type subspecies as follows: erect, suffruticose herb, villous to cottony indumentum with multicellular hairs and only very few glandular hairs when young, becoming scabrid with short antrorse simple hairs. Leaves linear to narrow-oblong, 1.5–2.5 cm long, 2–3 mm wide rarely more, entire or nearly so; margins revolute.

RANGE: Central and Southern Tablelands Districts of New South Wales.

HABITAT: Forests.

SELECTED SPECIMENS (12): NEW SOUTH WALES: Big Hill Stn. Upper Burragorang Valley, *E.F. Constable*, 4 Oct. 1956 (NSW 42828); Yerranderie, *R.H. Cambage 3131*, 2 Dec.

1911 (SYD, NSW 81469); Moss Vale, *P. Snowden 235*, 31 Oct. 1962 (NSW 81456, CANB 190035); Wingello S.F., *E.F. Constable*, 21 Jan. 1956 (NSW 35344); Bluebush Range to Kiaramba Ridge, *L.A.S. Johnson*, 28 March 1948 (NSW 5023); Tolwong turnoff Nerriga-Jervis Bay road, *R. Pullen 2025*, 8 Dec. 1959 (NSW 1407).

Named from its occurrence in the Central and Southern Tablelands of New South Wales. Latin, *montanus* = montane.

G. rotundifolia *R. Br.*, Prodr.: 576 (1810).

LECTOTYPE: QUEENSLAND: Shoalwater Bay Passage, *R. Brown*, 26 Oct. 1802 (BM). ISOLECTOTYPES: K, MEL 23858, P. PARALECTOTYPE: Paterson River (East Coast), *R. Brown* (BM). Brown recognises two variations: α '*glaberrima*' and β '*pubescens*'. There are two collections of *G. rotundifolia* by Brown in BM, one from the Paterson River, N.S.W., and the other the lectotype. The general description he gives covers both of them fairly adequately. However the specimen from Shoalwater Bay, which is glabrous, is labelled *G. rotundifolia* both on the sheet and in his notes and agrees closely with α '*glaberrima*. . . . . '. The Paterson River (East Coast) specimen however is referred to as '*G. crenata*' in his notes. This later name was never used but the specimen is labelled '*G. rotundifolia*' and agrees with the description of β '*pubescens*'. There seems little doubt that an element of α '*glaberrima*' must be selected as a type despite its being glabrous — an uncommon feature in the species.

G. arenicola *Carolin*, **sp. nov.**

Herbae stoloniferae vel rhizomatosae. Folia oblanceolata 4–10 cm longa pilis simplicibus glandulosisque parvissimis integra vel dentata in rosulis indistinctis disposita. Flores in axillis foliorum in pedunculis pubescentibus bracteolatis dispositi. Sepala lineari-deltoidea 5–6 mm longa. Corolla flava 15–17 mm longa pilis parvis extra atque enationibus intra. Ovarium attenuatum ad basim biloculatum fere ad summum. Indusium transverse oblongum 2 mm longum plicatum.

HOLOTYPE: QUEENSLAND: Stradbroke Island, *s.c., HT 13903*, s.d. (NSW).

Branched, stoloniferous or rhizomatous herb. *Leaves* clustered at ends of short pubescent stems, oblanceolate, 4–10 cm long, 8–14 mm wide, tapering into a distinct petiole 2–4 cm long, entire or dentate, sparsely pubescent with minute simple and glandular hairs scattered over both surfaces. *Flowers* solitary in leaf axils, peduncles minutely pubescent, 3–4 cm long; pedicels 3–4 cm long; bracteoles linear, 4–6 mm long, 0.3 mm wide, pubescent. *Sepals* linear-deltoid, 5–6 mm long, acute, entire, pubescent, adnate to ovary to its summit. *Corolla* yellow, 15–17 mm long, pubescent outside with minute mostly simple hairs, minutely pubescent and with rows of enations inside, auriculate; anterior pocket very short and obscure, less than ½ as long as ovary; tube 2.5–3 mm long; superior lobes falcate-oblanceolate, 10 mm long, 1.5–1.8 mm wide; inferior lobes ovate-oblong, 7–8 mm long, 2–2.5 mm wide; wings 2.5 mm wide; connate part of inferior lobes 6–7 mm long. *Stamen* filaments linear, 2–2.5 mm wide; anthers narrow-oblong, 1.8–2 mm long. *Ovary* tapering gradually to base, minutely pubescent; septum almost as long as loculus; ovules c. 30; style 5–6 mm long with a few scattered hairs; indusium transverse-oblong, 2 mm long, 2.5 mm wide, brownish, folded, glabrous above but pubescent beneath with a very curved orifice beset with minute white bristles c. 0.1 mm long. *Fruit* and seed not seen.

RANGE: Known only from the type collection.

HABITAT: Stabilized sand-dunes.

DISCUSSION: This species is clearly related to the *G. hederacea* group of species but very different from most of them. From other species with stoloniferous stems it differs in the minute soft indumentum and the very gradual taper to the base of the ovary.

Named for the habitat. Latin, *arena* = sand, *-cola* = an inhabitant or a dweller.

G. hederacea subsp. **alpestris** (*K. Krause*) *Carolin*, **comb. nov.**

BASIONYM: *G. hederacea* var. *alpestris* K. Krause, Pflanzenr. 54: 56 (1912).

LECTOTYPE: VICTORIA: Australian Alps, Mt Buller, *F. Mueller* (K). PARALECTOTYPES: Hardinger Range, *F. Mueller* (B destroyed, P); Mt. St. Bernhard, *Walter*, Jan. 1899 (B destroyed); Harrietville, Mt St Bernhard, *Weindorfer 66*, Dec. 1902 (W); Mt Hotham, *Weindorfer*, Dec. 1902 (B destroyed); Mt Kosciusko, *Kretschmann*, Dec. 1892 (B destroyed).

G. hederacea var. *cordifolia* Ewart, Fl. Victoria: 1073 (1931) = **G. hederacea** subsp **alpestris** *(K. Krause) Carolin.*

LECTOTYPE: Unfortunately no type for this variety has been located. Its identity is, however, not in doubt.

G. mooreana K. Krause, Pflanzenr. 54: 57 (1912) = **G. xanthosperma** *F. Muell.*

LECTOTYPE: WESTERN AUSTRALIA: Coolgardie, *Webster*, s.d. (BM); ISOLECTOTYPE: B destroyed. PARALECTOTYPES: Coolgardie, Gnarlbine, *S. Moore*, Sept. 1895 (BM); sudliche von Coolgardie, *Diels 5236*, Oct. 1901 (B destroyed).

G. geniculata *R. Br.*, Prodr.: 557 (1810).

LECTOTYPE: VICTORIA: Port Phillip, *R. Brown*, s.d. (BM). ISOLECTOTYPES: K, P.*

G. lanata *R. Br.*, Prodr.: 577 (1810).

LECTOTYPE: TASMANIA: Port Dalrymple, *R. Brown*, 5–6 Jan. 1804 (BM). ISOLECTOTYPES: K, MEL.*

G. goodeniacea (*F. Muell.*) *Carolin*, **comb. nov.**

BASIONYM: *Scaevola goodeniacea* F. Muell., Fragm. 1: 121 (1859). (*Catospermum goodeniaceum* (F. Muell.) K. Krause). The original spelling of the generic name by Bentham in Hooker's Icones Plantarum tab. 1028 is 'Catospermum'; he subsequently altered this to 'Catosperma' in Flora Australiensis 4: 83 and K. Krause also used this spelling. 'spermum', however, is an acceptable latinization and there is no reason to change the original spelling.

G. convexa *Carolin*, **sp. nov.**

Herba decumbens perennis. Folia obovata ad anguste obovata 3–12 cm longa dentata obtusa villosa utrinque pilis stellatis et multicellularibus in rosula pro parte maxima disposita. Flores in racemis foliosis pedunculis 1–6 cm longis. Bracteolae lineares vel anguste ovatae. Sepala anguste elliptica ad anguste oblonga 5–8 mm longa. Corolla flava 15–24 mm longa villosa extus sed sine enationibus intus. Capsula ovoideo-cylindrica 1–1.5 cm longa 4-valvulata.

HOLOTYPE: WESTERN AUSTRALIA: Swan River, *J. Drummond 405* (K). ISOTYPE: MEL 24318.

Decumbent usually perennial herb with short erect ± branched stock, ± hirsute with mostly stellate and multicellular hairs. *Scapes* terete, to 15 cm long. *Leaves*

mostly ascending from stock, obovate to narrow-obovate, 3–12 cm long, 4–25 mm wide, narrowing very gradually towards base, dentate, with few simple hairs amongst others towards apex. *Flowers* in condensed or elongated racemes; bracts leaf-like; peduncles 1–6 cm long; bracteoles linear to narrow-ovate, 4–15 mm long, 1–3 mm wide; pedicel 3–5 mm long, often geniculate at bracteoles, not articulate. *Sepals* narrow-elliptic to narrow-oblong, 5–8 mm long, 0.5–2 mm wide, obtuse, pubescent with multicellular and stellate hairs the former yellowish and usually tangled together, adnate to ovary for ¾ its length. *Corolla* yellow, 15–24 mm long, villous-pubescent outside with stellate and multicellular hairs and with a few simple ones towards top, with few scattered hairs towards base inside but no enations, auriculate; anterior pouch obscure, < ½ as long as ovary; tube 3–4 mm long; superior lobes narrow-oblong 12–15 mm long, 1.5–2 mm wide; inferior lobes narrow-oblong, 8–15 mm long, 1.5–2 mm wide; wings c. 2 mm wide; connate part of inferior lobes 4–6 mm long. *Stamen* filaments linear, c. 3 mm long; anthers narrow-oblong, c. 1.5 mm long. *Ovary* villous; septum almost as long as loculus; ovules c. 30; style 3–4 mm long, slightly villous towards top; indusium transverse-oblong to transverse-obovate, c. 3 mm long, 2–2.5 mm wide, slightly folded, villous, with a very convex orifice beset with white bristles c. 0.2 mm long. *Fruit* ovoid to cylindrical, 1–1.5 cm long, c. 6 mm wide, 4-valved but scarcely separating below level of sepals. *Seeds* flat, pale brown, elliptic, 1.8–2.5 mm long, smooth, with a distinct rim; wing 1.2–1.5 mm wide, mucilaginous.

RANGE: Avon District of Western Australia

HABITAT: Heath and open forests on sandy soils.

CHROMOSOME NUMBER: $n = 8$ (Peacock 1963, as *G. affinis).*

DISCUSSION: This species has previously been included in *G. affinis* and differs from it in the very convex lips of the indusium, the looser coarser simple hairs, and a tendency to form almost stoloniferous scapes. It also shows some similarities to *G. robusta* but its bracts and cauline leaves are never stem-clasping as in that species.

SPECIMENS EXAMINED (10): WESTERN AUSTRALIA: Jurien Bay road, *W.E. Blackall 3658*, 29 Aug. 1938 (PERTH); Youndegin, *C.A. Gardner 7483*, 19 Oct. 1944 (PERTH); Taylors Well near Pingelly, *R.C. Carolin 3166*, 18 Aug. 1961 (SYD); 21 miles (33.6 km) W of Coorow, *C.H. Gittins 1675*, Sept. 1967 (NSW).

Named for the very convex orifice of the indusium. Latin, *convexus* = convex.

G. tripartita *Carolin*, **sp. nov.**

Herba decumbens vel prostrata. Scapi usque 15 cm longi. Folia basalia anguste elliptica vel late elliptica vel obovata 4–7 cm longa 1–2 cm lata crenato-dentata albide villosa pilis stellatis et multicellularibus versus basim in petiolum contracta. Flores in pedunculis bibracteolatis. Corolla flava c. 18 mm longa gossypine villosa extus sine enationibus intus. Indusium 3-fidum ramo medio late obovato et ramo laterali curvo-lineari plicato. Capsula 2-valvulata sed non ad basim. Semina plana flava laevia elliptica 2 mm longa ala indistinctissima.

HOLOTYPE: WESTERN AUSTRALIA: Ongerup-Ravensthorpe, Fitzgerald River, *R.C. Carolin 3569*, 11 Sept. 1961 (NSW).

Decumbent to prostrate perennial herb with a strong taproot and stock, cottony-villous with stellate and multicellular hairs the latter often tangled together. *Scapes* terete, to 15 cm long. *Leaves* mostly basal, narrow-elliptic to broad-elliptic or obovate, 4–7 cm long, 1–2 cm wide, narrowing often abruptly

into a ± distinct petiole, crenate-dentate, sometimes slightly crisped. *Flowers* in racemes; bracts leaf-like but smaller; peduncles 1–3 cm long; bracteoles linear, c. 4 mm long, 1 mm wide, often obscured by hairs; pedicels 1–2 cm long, geniculate at bracteoles, not articulate. *Sepals* linear, 4–5 mm long, 1 mm wide, ± obtuse, adnate to ovary almost to its summit. *Corolla* bright yellow, c. 18 mm long, villous outside with stellate multicellular and a few simple hairs, sprinkled with a few hairs but without enations inside, auriculate; anterior pocket less than ½ as long as ovary; tube 1.5–2 mm long; superior lobes narrow-obovate to narrow-elliptic, ± falcate, c. 11 mm long, 2.5 mm wide; inferior lobes oblong-elliptic, 8–9 mm long, 2.5–3 mm wide; wings c. 2.5 mm wide; connate part of inferior lobes 5–6 mm long. *Stamen* filaments 3 mm long; anthers narrow-oblong, 2 mm long. *Ovary* septum almost as long as loculus; ovules 30–32; style 4 mm long, glabrous; indusium 3-fid; median branch broad-ovate, 1 mm long, 2.5 mm wide, yellow-brown, with few villous hairs, folded in front of the median branch, with a curved orifice beset with bristles c. 0.1 mm long or lips glabrous; side-branches curved-linear, c. 1 mm long, surmounted by a tuft of white bristles. *Fruit* ovoid, c. 13 mm long, c. 7 mm wide, 2-valved but usually only to midway, each valve bifid. *Seed* flat, yellow, elliptic, c. 2 mm long, smooth, with a distinct rim; wing almost obsolete.

RANGE: Esperance district of Western Australia.

HABITAT: Sandy soils

CHROMOSOME NUMBER: $n = 8$ (Peacock 1963, as *G. affinis*).

DISCUSSION: Previously included in *G. affinis*, this species can be distinguished by its 3-partite indusium.

SPECIMENS EXAMINED (39): WESTERN AUSTRALIA: Marchagee, *F. Vanzetti*, Oct. 1925 (PERTH); Waddouring, *W.B. Alexander 1242*, Oct. 1915 (PERTH); 1 mile (1.6 km) E of Boorabbin, *C.A. Gardner*, 20 Oct. 1945 (PERTH); 2 miles (3.2 km) from Dowerin towards Wyalkatchem, *M.E. Phillips*, 19 Sept. 1962 (CBG 019012, SYD); between Pingrup and Lake Grace, *W.E. Blackall* 3054, 21 Sept. 1933 (PERTH); Nyabing, *R.H. Kuchel* 1881, 17 Sept. 1964 (AD 96531152); 1 mile (1.6 km) S of Borden, *F. Lullfitz* L3363, 16 Aug. 1964 (PERTH).

The specific epithet refers to the indusium, which is divided into three distinct parts, two curved linear lateral lobes and a broad-ovate central part. Latin, *tri-* = three, *partitus* = partite.

G. willisiana *Carolin*, **sp. nov.**

Herba erecta vel ascendens villosa pilis stellatis et multicellularibus caulorrhiza erecta ramosa et scapis brevis. Folia basalia anguste elliptica vel anguste obovata, 4–9 cm longa, 4–18 mm lata. Corolla flava c. 15 mm longa villosa extus glabra et sine enationibus intus. Septum ovarii tres partes longitudinem loculi. Indusium transverse ellipticum 1.5 mm longum 2.5 mm latum plicatum. Capsula 2-valvulata. Semina plana flava laevia elliptica 2 mm longa, ala brevissima.

HOLOTYPE: Redcliffs, NW Victoria, *J.H. Willis*, Aug. 1940 (MEL 24304). There are three specimens mounted on the same sheet. 'Wimmera, *C. Walter*' without date, and 'Redcliffs, *J.H. Willis*, Aug. 1937' are herewith excluded from the type. The holotype consists only of the remaining specimen from Redcliffs.

Erect or ascending herb with thick taproot and usually a well-developed stock, covered with villous stellate and multicellular hairs the latter tangled around each other. *Scapes* terete, usually shorter than leaves. *Leaves* basal, narrow-elliptic to narrow-oblong or lanceolate, 4–9 cm long, 4–18 mm wide, narrowing

very gradually towards base, obtuse or acute, entire or irregularly dentate; cauline leaves if present never stem-clasping. *Flowers* apparently solitary in axils of basal leaves; peduncles to 5 cm long; bracteoles linear, c. 2 mm long, almost obscured by hairs; pedicels to 4 mm long, geniculate at bracteoles, not articulate. *Sepals* narrow-oblong, 3.5 mm long, 0.5 mm wide, acute, adnate to ovary nearly to its top. *Corolla* yellow, 15 mm long, villous-pubescent outside with stellate and multicellular hairs only very rarely with a few simple hairs towards top, glabrous or nearly so and without enations inside, auriculate; anterior pocket < ½ as long as ovary; tube 2–3 mm long; superior lobes narrow-obovate-elliptic, 8–9 mm long, 1.5–1.8 mm wide; inferior lobes oblong-elliptic, 5–6 mm long, c. 1.5 mm wide; wings c. 2.5 mm wide; connate part of inferior lobes 4–6 mm long. *Stamen* filaments linear, c. 2 mm long; anthers narrow-oblong, c. 1.5 mm long. *Ovary* septum ¾ as long as loculus; ovules 28–30; style 3.5 mm long, glabrous, scarcely geniculate; indusium transverse-elliptic, 1.5 mm long, 2.5 mm wide, folded, glabrous on back, with few villous hairs on front, with a curved orifice beset with white bristles to 0.2 mm long on both lips. *Fruit* ovoid-ellipsoid, c. 1 cm long, 4–5 mm wide, 4-valved to midway or 2-valved to base with each valve bifid. *Seeds* flat, yellow, elliptic, 2 mm long, smooth, with a distinct rim; wing c. 0.1 mm wide.

RANGE: Southern part of South Australia, western Victoria and the Riverina district of New South Wales.

HABITAT: Mallee and open forest in dry communities.

DISCUSSION: This species has been referred to *G. affinis* in the past. The species related to *G. affinis* are listed below together with the main features distinguishing them.

G. affinis. Indusium with a shallowly concave upper lip; bristles short. Indumentum villous. Cauline leaves not stem-clasping.

G. willisiana. Indusium with a straight to slightly convex orifice; bristles long. Indumentum villous. Cauline leaves not stem-clasping.

G. convexa. Indusium with a very convex orifice; bristles long. Indumentum hirsute, tangled. Cauline leaves not stem-clasping.

G. tripartita. Indusium 3-lobed; bristles long on lateral lobes. Indumentum villous. Cauline leaves not stem-clasping.

G. robusta. Indusium with a very convex orifice; bristles short. Indumentum villous. Cauline leaves stem-clasping.

SPECIMENS EXAMINED (87): SOUTH AUSTRALIA: N of Caroline Bluff, Mt. Gambier, *J.B. Cleland*, 9 Nov. 1955 (AD 96720010); 10 miles (16 km) W of Minnipa, *H.W. Caulfield 31*, 21 Sept. 1955 (AD 96213166); Pinkawillinie, *R.D. Rohrlach 189*, 1 March 1959 (AD 95924013). VICTORIA: Nhill-Murrayville, *J.J. Ackland 79*, 1 Oct. 1963 (MEL 24305); Dimboola, *D. Kraehenbuehl 35*, 11 Oct. 1958 (AD 96422050). NEW SOUTH WALES: Rankins Springs road, *G. Althofer 8A*, 1966 (NSW).

Named for J.H. Willis, formerly of the National Herbarium of Victoria, who collected the type specimen.

G. geniculata var. *robusta* Benth., Fl. Austral. 4: 63 (1868) = **G. robusta** *(Benth.) K. Krause,* Pflanzenr. 54: 53 (1912).

LECTOTYPE: SOUTH AUSTRALIA: Marble Range, *Willhelmi*, s.d. (K). ISOLECTOTYPE: MEL, P. PARALECTOTYPES: Wimmera, *Dallachy* (MEL); Lake Koorong, Herb. Muell. (MEL); Marble Range, *Willhelmi* (K, MEL, P).

G. glabra *R. Br.*, Prodr.: 577 (1810).

LECTOTYPE: SOUTH AUSTRALIA: Port 1, *R. Brown*, s.d. (BM). ISOLECTOTYPE: K.*

G. gracilis *R. Br.*, Prodr.: 575 (1810).

LECTOTYPE: QUEENSLAND: Broad Sound, *R. Brown*, 15 Sept. 1802 (BM). ISOLECTOYPE: K.*

G. rosulata Domin, Biblioth. Bot. 22: 1198 (1929) = **G. paniculata** *Sm.*

LECTOTYPE: QUEENSLAND: Aperti loci arenosi in xerodrymio ad opp. Jericho, *Domin 8783*, March 1910 (PR 531399).

G. macbarronii *Carolin*, **sp. nov.**

Herba plus minusve annua. Folia basalia anguste obovata usque linearilanceolata 5–11 cm longa glabra crassa dentibus paucis. Flores in racemis vel thyrsis erectis dispositi. Bracteae lineares. Pedunculi glabri usque 25 mm longi bracteolis triangularibus. Corolla flava 7–9 mm longa pubescentia extus. Lobi superiores corollae auriculati. Capsula subglobosa 3–4 mm longa duabus valvis dehiscens. Semina nitida biconvexa orbicularia 0.5 mm diametro.

HOLOTYPE: NEW SOUTH WALES: Holbrook, *E.J. McBarron 647*, 10 Feb. 1947 (NSW). ISOTYPE: SYD.

Annual or short-lived erect perennial herb with a short stock, with well-developed secondary root system and sometimes a thickish tap root. *Scapes* terete or slightly angled when young, to 30 cm, glabrous. *Leaves* thick, mostly basal, narrow-obovate to linear-oblanceolate, 5–11 cm long, 2–6 mm wide, narrowing very gradually into an indistinct petiole with a broadened scariose base, acute, with a few coarse teeth on margin, glabrous. *Flowers* in erect terminal thyrses or racemes; bracts linear, 2–20 mm long, 0.5–1 mm long; bracteoles triangular, 1–1.5 mm long, 0.3–0.5 mm wide, acute, glabrous or with a few mostly simple hairs; pedicel 0.5–3 mm long, simple-pubescent or glabrous below but mostly glandular-pubescent above articulate c. 0.5 mm below ovary. *Sepals* linear to elliptic, 1–2 mm long, 0.2–0.5 mm wide, glandular-pubescent with few simple hairs, acute, entire, adnate to ovary for ¾ its length. *Corolla* yellow, 7–9 mm long, glandular-pubescent with a few simple hairs outside, sprinkled with simple and glandular hairs, with very few obscure enations inside, auriculate; anterior pouch obscure; tube 2–2.5 mm long; superior lobes oblanceolate, c. 5 mm long, 1 mm wide; inferior lobes oblong-elliptic, 4–4.5 mm long, 1 mm wide; wings 1–1.2 mm wide; connate part of inferior lobes c. 2 mm long. *Stamen* filaments linear, 1.5 mm long; anthers narrow-oblong c. 1 mm long, c. 0.3 mm wide, apiculate. *Ovary* glandular-pubescent, with few simple hairs; septum ¾ as long as loculus; ovules numerous, scattered on placentas; style 5 mm long, villous-pubescent; indusium square, 1 mm long, brown sometimes tinged with purple, not folded but sometimes slightly notched, with a straight orifice beset with white bristles c. 0.1 mm long on upper lip and somewhat shorter ones on lower lip. *Fruit* subglobular to ovoid, 3–4 mm long, c. 2 mm wide, glandular and simple-pubescent, 2-valved almost to base, each valve entire. *Seeds* biconvex, yellow-brown, orbicular, 0.5 mm diam., reticulate-foveate, shining; wing < 0.1 mm wide, mucilaginous.

RANGE: North East Victoria; Western Plains, Western Slopes and Tablelands in New South Wales and Darling Downs in Queensland.

HABITAT: Damp places.

CHROMOSOME NUMBER: $n = 8$ (Peacock 1963, as *G. gracilis* Sm).

DISCUSSION: This has previously been confused with *G. gracilis*, from which it differs in the indusium which is not folded, and with *G. paniculata*, from which it differs in the thicker narrower leaves, the smaller square indusium which is never altogether purple, the smaller flowers and the chromosome number. The specimens from Victoria tend to have rather larger flowers but otherwise agree fairly well with those from north of the Murray River.

SELECTED SPECIMENS (25): VICTORIA: Ovens River, *F. Mueller*, 9 Feb. 1853 (MEL 23419). NEW SOUTH WALES: Maryland, *E. Hickey*, Jan. 1885 (MEL 23338); Tingha, *J.L. Boorman*, March 1917 (NSW 81554); Chandlers Peak Guyra, *J.L. Boorman*, March 1917 (NSW 81556); Warrumbungle Ranges, *E. Betche* 60, Jan. 1883 (MEL 23352); 15 miles (24 km) E of Rylestone, *H.S. McKee 444*, 10 Jan. 1953 (SYD). QUEENSLAND: Fletcher, Stanthorpe district, *W.J.F. McDonald 1758*, 31 Jan. 1977 (BRI 221919).

Named for the collector of the holotype, an avid collector, who was a veterinarian in the New South Wales Department of Agriculture.

G. lamprosperma *F. Muell.*, Fragm. 1: 116 (1859).

LECTOTYPE: NORTHERN TERRITORY: Upper Victoria River, *F. Mueller*, Dec. 1855 (MEL 23395). ISOLECTOTYPE: K. Paralectotype: Near McAdams Range, *F. Mueller*, Dec. 1855 (MEL 23396).

G. humilis *R. Br., Prodr.*: 575 (1810).

LECTOTYPE: VICTORIA: Arthur's Seat, Port Phillip, *R. Brown*, 25 Jan. 1804 (BM). ISOLECTOTYPES: K, MEL, P.*

G. propinqua W. Fitzg., J. & Proc. Roy. Soc. Western Australia 3: 213 (1918) = **G. bicolor** *F. Muell.*

LECTOTYPE: WESTERN AUSTRALIA: Inglis Gap, King Leopold Ranges, *W.V. Fitzgerald*, s.d. (NSW). PARALECTOTYPES: Bold Bluff, Isdell River, *W.V. Fitzgerald* (NSW).

G. gloeophylla *Carolin*, **sp. nov.**

Herba erecta suffruticosa viscidula ad 50 cm alta. Folia caulina linearia ad anguste elliptica 4–8 cm longa anguste dentata plus minusve sessilia. Flores in racemis vel thyrsis terminalibus dispositi. Pedunculi bracteolati viscidula. Pedicelli articulati. Sepala anguste deltoidea 1–1.5 mm longa pilis glandulosis. Corolla lilacina vel violacea 10–12 mm longa pilis glandulosis extra. Ovulae in placentis irregulariter dispositae.

HOLOTYPE: WESTERN AUSTRALIA: Longini Landing, Kalumburu Mission, *D.E. Symon 7125*, 29 May 1971 (ADW 41918). ISOTYPES: CANB, PERTH, SYD.

Erect branched glandular-pubescent and viscid suffruticose herb. *Leaves* scattered along stems, linear to very narrow-elliptic, 4–8 cm long, 1–2.5 mm wide, tapering very gradually to a blunt tip and towards base into an indistinct petiole, dentate with narrow teeth, with very short villous axillary hairs. *Flowers* in terminal racemes or thyrses; bracts leaf-like but narrower and shorter and never exceeding flower; peduncles to 18 mm long; bracteoles linear, 3–8 mm long, acute, entire, often not exactly opposite; pedicels 2–4 mm long, articulate 1–2 mm below ovary. *Sepals* narrow-deltoid, 1–1.5 mm long, 0.3–0.5 mm wide, acute, entire, adnate to ovary almost to its summit. *Corolla* pale to deep purple, 10–12 mm long, glandular-pubescent outside, with few long simple hairs inside, indistinctly auriculate; anterior pocket prominent and half as long as or equal to ovary; tube 3–4 mm long; superior lobes narrow-oblong-elliptic, 6–6.5 mm long, 0.8–1.2 mm long; inferior lobes narrow-oblong-elliptic, 5–6 mm long, 0.8–1.2 mm wide; wings c. 1 mm wide. *Stamen* filaments linear, c. 3 mm long;

anthers narrow-oblong, 1.5 mm long, 0.3–0.5 mm wide. *Ovary* glandular-pubescent; septum almost as long as loculus; ovules c. 20 in two ± irregular rows; style 4–5 mm long, glabrous; indusium broad-ovate-oblong, 1.5 mm long, 1 mm wide, purple, folded, with few long white hairs on both surfaces towards base, with a straight orifice beset with bristles to 0.1 mm long. *Fruit* cylindrical to ovoid, 8–10 mm long, 3 mm wide, 2-valved. *Seed* biconvex, brown, elliptic, 1.5 mm long, reticulate-foveate, glossy with a distinct rim; wing c. 0.1 mm wide.

RANGE: Gardner (Kimberley) Region of Western Australia and Darwin–Gulf Region of Northern Territory.

HABITAT: Heaths and shrublands on poor sandy soils.

DISCUSSION: This species is tentatively placed in section *Porphyranthus* on the basis of the irregular ovule insertion, and the seed ornamentation, the folded indusium with shortish bristles and the pedicel articulation. The suffruticose habit is unknown in the rest of that section.

SPECIMENS EXAMINED: WESTERN AUSTRALIA: (see holotype). NORTHERN TERRITORY: 2–3 miles (3.2–4.8 km) N of El Sharana, *Martensz & Schodde AE 565* (NT 38842); Waterfall Creek 1 mile (1.6 km) above falls (South Alligator), *N. Byrnes NB1518* (NT 14994); 13° 03'S 132° 56'E, *M. Lazarides 8011*, 4 April 1973 (CANB 239891); 41 miles (65.6 km) from Pine Creek to U.D.P. Falls, *C.H. Gittins 2846*, 1 May 1975 (SYD, BRI).

Named for the viscid leaves. Greek, *gloeus* = sticky, *phyllon* = leaf.

G. purpurascens *R. Br.*, Prodr.: 578 (1810).

LECTOTYPE: NORTHERN TERRITORY: Bay No. 3, Point 2, (i.e. Arnhem Bay), *R. Brown*, 3 March 1903 (BM).# Brown made two collections of this species, describing both collections in his field notes. In the Prodromus he describes this species as 'foliis radicalibus elongato-lanceolatis' but in his field notes only the specimens from Arnhem Bay are described as having lanceolate leaves. The Arnhem Bay specimens agree with this description whilst the other collection, from Groote Island, has linear leaves and Brown describes them as such in his field notes. The Arnhem Bay collection is therefore selected as the lectotype.

G. minutiflora *F. Muell.*, Fragm. 8: 224 (1874).

LECTOTYPE: QUEENSLAND: Between the Norman and Gilbert Rivers, *T. Gulliver 68* (MEL 23997). ISOLECTOTYPES: MEL 23998, 22243.*

G. viscidula *Carolin*, **sp. nov.**

Herba annua adscendens ad 25 cm alta radicibus fibrosis. Folia spathulata 4-11 cm longa pubescentia viscidula pilis simplicibus ac glandulosis brevis integra vel dentis paucis parvis in rosula erecta vel adscendenti disposita. Flores in thyrsis vel cymo-paniculis dispositi. Pedicelli et pedunculi viscidula pilis simplicibus brevis et glandulosis capitate brunne vel fulve. Corolla lilacina 5–7 mm longa pilis brevis patentibus extra. Ovulae numerosae in placentis dispersae. Capsula subglobosa vel ovoidea c. 1.5 mm in diametro. Semina biconvexa elliptica c. 0.3 mm longa nitida.

HOLOTYPE: NORTHERN TERRITORY: 166 miles from Borroloola on Daly Waters road, *R.C. Carolin 9339*, 19 May 1974 (NSW). ISOTYPE: SYD.

Erect to ascending viscid annual herb to 25 cm high, covered with simple and somewhat more numerous shortly stalked yellowish or brownish tipped glandular hairs, with a short stock and an adventitous root system. *Leaves* mostly basal, spathulate in overall shape but with a rather more distinct petiole than in

other members of sect. *Porphyranthus*, (4–) 6–11 cm in overall length; lamina elliptic, 2–4 cm long, 10–20 mm wide, entire or obscurely toothed and sometimes with two narrow lobes near the base, usually acute. Cauline leaves similar but smaller. *Flowers* arranged in loose thyrses or cymo-panicles; bracts linear, c. 1 mm long; bracteoles linear, to 5 mm long, acute; often not exactly opposite; pedicels (6–) 9–11 mm long, articulate c. 0.5 mm below ovary. *Sepals* narrow-ovate-elliptic, 1 mm long, 0.3 mm wide, acute, adnate to ovary for ⅔ its length. *Corolla* bluish purple, 5–7 mm long, pubescent with short soft patent simple hairs outside, with a few scattered hairs inside, indistinctly auriculate; anterior pocket scarcely ¼ as long as ovary; tube 2–3 mm long, curved; superior lobes narrow-oblong to oblanceolate, 3 mm long, 0.8 mm wide; inferior lobes ovate, 2 mm long, 0.8 mm wide; wings c. 1 mm wide; connate part of inferior lobes 2–3 mm long. *Stamen* filaments linear, 2 mm long; anthers narrow-oblong, 1 mm long. *Ovary* pubescent as outside of corolla; septum almost as long as loculus; ovules numerous, minute, scattered over both surfaces of septum; style 2.5 mm long, purple, villous; indusium square to oblong, c. 1 mm long, purple, not folded, with a straight orifice beset with short (0.1 mm) white bristles on upper lip, lower lip almost glabrous. *Fruit* subglobular to ovoid, c. 1.5 mm diam., pubescent, 2-valved often scarcely to midway very rarely to base, entire. *Seeds* biconvex, elliptic, c. 0.3 mm long, brownish, glossy, smooth to reticulate, with obscure rim; wing, narrow, mucilaginous.

RANGE: Burke District in Queensland and Darwin–Gulf District in Northern Territory.

HABITAT: Seasonally damp sites especially in *Melaleuca* and *Eucalyptus microtheca* woodland.

DISCUSSION: This species is distinguished from the other species grouped around *G. purpurascens* by the pubescent, viscid, ± distinctly petiolate leaves. The flowers are somewhat larger than those of *G. paludicola* and *G. minutiflora*.

SELECTED SPECIMENS (6): NORTHERN TERRITORY: Camp-Oven Waterhole, *R.C. Carolin 9167*, 9 May 1974 (SYD); 14 miles (22.4 km) NW of Corinda on road to Westmoreland, *R.C. Carolin 9146*, 7 May 1974 (SYD); Edith Falls, *R.A. Perry 1941*, 28 Aug. 1948 (BRI 015293).

Named for the viscid nature of the whole plant. Latin *viscidulus* = somewhat sticky.

G. paludicola *Carolin*, **sp. nov.**

Herba annua gracilis adscendens ad 25 cm radicibus fibrosis. Folia basalia adscendentis vel erecta lanceolata 4–7 cm longa glabra integra vel dentibus paucis parvis. Flores in thyrsis vel cymo-paniculis decompositis dispositi. Pedicelli et pedunculi pilis simplicibus patentis et pilis glandulosis capitatis nigris vel fuscis obtecti. Corolla lilacina 4–12 mm longa pilis simplicibus ac glandulosis extra. Ovulae numerosae in placentis dispersae. Capsula subglobosa 1.2–2.5 mm in diametro. Semina nitida fulva biconvexa elliptica 0.3–0.4 mm longa.

HOLOTYPE: QUEENSLAND: 14 miles (22.4 km) NW of Corinda on road to Westmoreland, *R.C. Carolin 9147*, 7 May 1974 (NSW). ISOTYPE: SYD.

Slender ascending annual herb to 25 cm, with a weak stock and mostly adventitious roots. *Scapes* numerous in axils of basal leaves, almost glabrous near base. *Leaves* almost all basal, ascending or erect, lanceolate, 4–7 cm long, 2–4 mm wide, tapering very gradually towards base into a very indistinct petiole,

acute, entire or with few very obscure teeth, glabrous. *Flowers* arranged in much-branched thyrses or cymo-panicles; bracts leaf-like but smaller and somewhat pubescent; peduncles to 3 mm long, pubescent with patent simple hairs and long black or very dark brown-tipped glandular hairs; bracteoles linear, 3–5 mm long, pubescent as peduncles, acute, not always exactly opposite; pedicels 7–9 mm long, pubescent as peduncles, articulate c. 0.5 mm below ovary. *Sepals* ovate to lanceolate 1.5–1.8 mm long, 0.5 mm wide, simple- and glandular-pubescent, acute, adnate to ovary for ⅔ its length. *Corolla* bluish purple, 4–5 (12) mm long, simple- and glandular-pubescent outside, with very few scattered simple hairs inside, auriculate; anterior pouch almost obsolete; tube 2–3 mm long; superior lobes narrow-oblong, 2–3 mm long, 0.5 mm wide; inferior lobes ovate to narrow-ovate, 1.2 mm long, 0.5 mm wide; wings c. 1 mm wide, ± as long as lobes; connate part of inferior lobes 1.5 mm long. *Stamen* filaments linear, 1.5 mm long; anthers oblong, 0.5 mm long. *Ovary* glandular- and simple-pubescent; septum almost as long as loculus; ovules numerous, scattered over both surfaces of septum; style 4 mm long, slightly pubescent especially towards top; indusium ± square but widening a little towards top, 0.5 mm long, purplish, glabrous, with an almost straight orifice beset with white bristles c. 0.2 mm long on upper lip but almost glabrous on lower lip. *Fruit* subglobular, 1.5–2.5 mm diam., simple- and glandular-pubescent, 2-valved to below midway but seldom to base, each valve entire. *Seeds* biconvex, yellowish, elliptic, 0.3–0.4 mm long, smooth, glossy, with an obscure rim; wing c. 0.1 mm wide, mucilagenous.

RANGE: Burke District in Queensland and northern part of Northern Territory.

HABITAT: Seasonally moist places, particularly in *Melaleuca* woodlands, but not on the heavier soils.

DISCUSSION: This species is rather similar to *G. minutiflora* but the corolla is larger and deeper in colour and the auricles on the superior lobes enclose the indusium.

SPECIMENS EXAMINED: QUEENSLAND: 4 miles (6.4 km) N. of Maggieville on Myravale road, *R.C. Carolin 8766*, 20 May 1974 (SYD). NORTHERN TERRITORY: Tin Camp Creek c. 20 miles (24 km) S of Nabarlek, *T.G. Hartley 13775* (NT 44774); Katherine Gorge, *C.L.Gunn 14* (NT 44320); Ferguson River, *M. Parker 112* (NT 41718).

Named after the swampy conditions in which this species grows in the wet season. Latin, palus, *paludis* = swamp, *-cola* = a dweller.

G. berringbinensis *Carolin*, **sp. nov.**

Herba ad 30 cm scapis villosis. Folia basilia oblanceolata ad fere spathulata 3.5–6 cm longa villoso-pubescentia saepe glabrescentia. Flores in thyrsis laxis terminalis dispositi. Pedunculi 5–30 mm longi bracteolis lincari-ellipticis 4–15 mm longis. Pedicelli articulati 13–20 mm longi. Corolla flava villoso-pubescens extus. Ovulis numerosis in placentis dispersis. Capsula cylindrica 7–8 mm longa villosa-pubescens bivalvularis sepalis longitudine ½ partes adnatis. Semina numerosa parva nitidula 0.8 mm longa.

HOLOTYPE: WESTERN AUSTRALIA: Bed of Berringbine Creek, Belele Station, *C.A. Gardner 7857*, 15 Oct. 1945 (PERTH).

Villous and minutely glandular herb with a short usually branched stock, with thin tap root and a well-developed adventitous root system. *Scapes* terete, ascending to 30 cm. *Leaves* mostly basal, spreading or ascending, oblanceolate to almost spathulate, 3.5–6 cm long, 2–10 mm wide, tapering gradually into a

distinct petiole to 3 cm long with broad scarious base, obtuse, entire or with few blunt teeth, villous-pubescent, often ± glabrescent. *Flowers* in loose spreading terminal thyrses; bracts linear to elliptic, 4–15 mm long, 1–2 mm wide, entire; peduncles 5–30 mm long; bracteoles sometimes not exactly opposite, linear-elliptic, 3–4 mm long; pedicels 13–20 mm long, articulate c. 1 mm below ovary. *Sepals* lanceolate-elliptic, c. 3 mm long, 0.5 mm wide, adnate to ovary for ½–¾ its length. *Corolla* yellow with purplish auricles, c. 12 mm long, villous-pubescent with long simple and minute glandular hairs outside, with some scattered simple hairs inside, auriculate; anterior pocket not prominent, ± as long as ovary; tube c. 3 mm long; superior lobes narrow-oblong, 8 mm long, 0.8 mm wide; inferior lobes oblong, 4–5 mm long, 0.8 mm wide; wings to 2 mm wide; connate part of inferior lobes 5–6 mm long. *Stamen* filaments c. 3.5 mm long; anthers narrow-oblong, 1.5 mm long. *Ovary* villous-pubescent; septum ⅔ as long as loculus; style 7–8 mm long; indusium obtriangular, truncate at base, c. 1.5 mm long, 2 mm wide, convex, with an almost straight orifice beset with white bristles 0.3 mm long. *Fruit* ellipsoid to cylindrical, 7–8 mm long, prominently beaked (i.e. sepals attached about halfway), 2-valved to base, each valve entire. *Seeds* flat to biconvex, yellow-brown, elliptic, 0.8 mm long, smooth, glossy; wing c. 0.1 mm wide, mucilaginous.

RANGE: Known from the type collection only, north west of Meekatharra.

HABITAT: Red sandy loam.

DISCUSSION: The attachment of the sepals low down on the elongated capsule is characteristic of this species.

Named for the locality of the type collection.

G. lyrata *Carolin*, **sp. nov.**

Herba caulis prostratis usque 13 cm longis fere glabris sed pilis perpaucis minutis versus apicem et fasciculis pilorum villosorum in axillis instructis. Folia lyrata oblanceolata 7–28 mm longa crassa pubescentia molliter simpliciterque praesertim in marginibus costisque. Flores in racemis foliosis terminalibus dispositi. Pedunculi 2–3 mm longi pilis glandulosis simplicibusque bracteolis anguste ellipticis circa 3 mm longis. Pedicelli 3–5 mm longi articulati. Corolla flava 10–12 mm longa auriculata pubescens extus et pilis paucis simplicibus intus. Ovulae numerosae in duabus seriebus irregularis in placentis dispersae. Indusium transverse late oblongum circa 1.2 mm longum setis brevis purpurascentibus super labiis. Capsula ovoidea pubescens 5–6 mm longa 4-valvulata.

HOLOTYPE: WESTERN AUSTRALIA: 20 miles (32 km) W of Laverton, *A.S. George 2798*, 22 Aug. 1961. (PERTH).

Prostrate herb with a branched stock. *Stems* terete, to 13 cm long, glabrous but for a very few minute hairs towards top and conspicous villous tufts in axils of leaves and bracts. *Basal leaves* thick, spreading, oblanceolate in outline, lyrate, 7–28 mm long, 2–5 mm wide, with a well-defined petiole, obtuse, with some minute soft simple hairs especially on margins and lower surface of midrib; cauline leaves, when present, usually less lobed and smaller. *Flowers* in terminal leafy racemes; bracts elliptic to oblanceolate, 5–9 mm long, 2–2.5 mm wide, shortly petiolate, entire or with few small teeth; peduncles 2–3 mm long, sprinkled with some minute glandular and simple hairs; bracteoles narrow-elliptic, to elliptic, c. 3 mm long, and 1 mm wide; pedicels 3–5 mm long, similar to peduncles, articulate just below ovary. *Sepals* narrow-deltoid to lanceolate, 2–3 mm long, 0.4–0.5 mm wide, acute, sprinkled with minute glandular and

simple hairs, adnate to ovary for c. ⅔ its length. *Corolla* yellow, 10–12 mm long, sprinkled with minute soft simple and glandular hairs on outside, with few simple hairs inside, auriculate; anterior pocket indistinct; tube c. 3 mm long; superior lobes narrow-oblong, c. 6 mm long and 0.8 mm wide; inferior lobes narrow-oblong to narrow-deltoid, c. 4 mm long, 1 mm wide; wings c. 2 mm wide; connate part of inferior lobes c. 4 mm long. *Stamen* filaments linear, c. 1.5 mm long; anthers oblong, c. 1.5 mm long. *Ovary* tapering gradually towards base, minutely simple- and glandular-pubescent; septum almost as long as loculus; ovules numerous, in two very irregular rows on either side of placenta; style 4–5 mm long, villous; indusium transverse-broad-oblong, c. 1.2 mm long and 1.5 mm wide, purple, villous especially near base on undersurface, ± convex on upper surface, with a straight orifice beset with purplish bristles c. 0.2 mm long. *Fruit* ovoid, 5–6 mm long, minutely simple- and glandular-pubescent, with a distinct beak, equally 4-valved. *Mature seeds* not seen.

RANGE: Known only from the type collection.

HABITAT: Red sandy loam.

DISCUSSION: The shape of the capsule, which is ± equally 4-valved, the indumentum, the numerous somewhat irregularly arranged ovules which appear to give rise to small seeds, and the conspicuous tufts of villous wool in the axils of the leaves all indicate a relationship with *G. modesta* and its allies. *G. lyrata* is distinguished from other members of that group by the lyrate leaves.

Named after the lyrate basal leaves. Latin, *lyratus* = like a lyre.

G. erecta Ewart in Ewart & Davies, Fl. N. Territory: 265 (1917) = **G. modesta** *J. Black.*

LECTOTYPE: NORTHERN TERRITORY: 12 miles (19.2 km) NW of Nth. Terr. Survey Camp III, *G.F. Hill 329*, 12 June, 1911 (MEL).

G. claytoniacea *F. Muell. ex Benth.*, Fl. Austral. 4: 79 (1868) [as G. Laytoniana, an orthographic error].

LECTOTYPE: WESTERN AUSTRALIA: Swampy flats of Don River, *Maxwell* (K). ISOLECTOTYPE: MEL. PARALECTOTYPES: *Drummond 1st coll. 42; Drummond 406* (MEL 23318); *Drummond* [159] (?MEL 23319), the sheet bearing this specimen has no collector's number but the number '159' is given in the protologue. Bentham described this species under the binomial 'G. laytoniana F. Muell. Herb'. He cites the specimens indicated above but only one of these is now at K. This, since it agrees with the description, accordingly is selected as the lectotype. Mueller's writing is not always as legible as one would wish and it is fairly clear that Bentham intended to use Mueller's unpublished name but misinterpreted the handwriting. Furthermore, *G. claytoniacea* has been used consistently since Mueller corrected the name in 1882. Consequently I am herewith accepting the corrected name as legitimate.

G. arthrotricha *F. Muell. ex Benth.*, Fl. Austral. 4: 62 (1868).

HOLOTYPE: WESTERN AUSTRALIA: *Drummond 190* (K). ISOTYPES: BM, MEL 24113.

G. bonneyana F. Muell., Fragm. 6: 226, t.53 (1868) = **G. arthrotricha** *F. Muell. ex Benth.*

LECTOTYPE: WESTERN AUSTRALIA: *Drummond 190* (MEL 24113). ISOLECTOTYPES: BM, K. PARALECTOTYPE: The plate, F. Muell., loc. cit. t. 53 (1868). Bentham and Mueller discuss or note each other's descriptions of, and comments on, both the names under consideration. Mueller cites even the page numbers of the reference to both species in Flora

Australiensis, but Bentham only refers to the plate of *G. bonneyana* and states explicitly that he has not seen the description of it. Despite this, there can only have been a few days or weeks between the issue of Flora Australiensis, vol. 4 on 16th December 1868 (see Stafleu & Cowan 1976) and Fragmenta vol. 6 'Fine Decembris 1868' as indicated on its last page. The mail ships took about 80 days to make the passage between Melbourne and London so, clearly, both must have had copies of at least part of each other's publications before the date of issue. Mueller probably received the Goodeniaceae proofs for Flora Australiensis in late July since a letter of 23 Sept. 1868 written by him to Bentham seems to be the first indication of his receiving proofs of vol. 4 which he was eagerly awaiting. I have been unable to find any reference to a distribution of the plates of Fragmenta before the publication of the corresponding fascicles. It is probable that Mueller included a print of *G. bonneyana* in the consignment of Goodeniaceae shipped at the beginning of April 1867. There is however, no evidence that this print of tab. 53 of Fragmenta, which would constitute a valid publication of *G. bonneyana*, was distributed to anyone other than Bentham before the fascicle containing the description was issued. The priority then must rest with *G. arthrotricha* since Dec. 16th can scarcely be taken to be the same as 'Fine Decembris'.

G. coerulea *R. Br.*, Prodr.: 578 (1810).

LECTOTYPE: WESTERN AUSTRALIA: Princess Royal Harbour, King Georges Sound, *R. Brown*, Dec. 1802 (BM). ISOLECTOTYPES: K, MEL, P.*

G. trichophylla *Vriese ex Benth.*, Fl. Austral. 4: 67 (1868).

LECTOTYPE: WESTERN AUSTRALIA: *Drummond 3rd coll. 158* (K). ISOLECTOTYPE: MEL, P, BM. PARALECTOTYPE: *Drummond 2nd. coll. 407* (K). *Drummond no. 158* is selected because the paralectotype has simple hairs on the calyx and corolla — a characteristic not mentioned by Bentham. Indeed he specifically emphasizes the glandular hairs.

G. perryi *Gardner ex Carolin*, **sp. nov.**

Herba ascendens vel erecta usque 25 cm alta. Folia basalia oblanceolata 4–5 cm longa gossypine villosa integra fere sessilia. Flores in racemis terminalibus dispositi bracteis anguste oblongis usque linearibus 5–10 mm longis. Pedunculi bracteolis linearibus 2–6 mm longis. Sepala lineari-deltoidea 7–8 mm longa. Corolla coerulea glabra extus sed pilis paucis atque enationibus intus aurieulata plus minusve distincta. Ovarium villosum septo longitudinem loculi fere aequanto. Indusium suborbiculare c. 2 mm longum.

HOLOTYPE: WESTERN AUSTRALIA: Bunjil, *C.A. Gardner* 15 Oct. 1961 (PERTH).

Ascending or erect herb to c. 25 cm with a branched stock. *Stems* obscurely ridged when young becoming ± terete, cottony hairy. Basal leaves oblanceolate, 4–5 cm long, 6–10 mm wide, tapering very gradually towards broadened base, obtuse, entire, cottony with multicellular cells; cauline leaves similar but smaller. *Flowers* in terminal thyrses or racemes; bracts mostly narrow-oblong to linear, 5–10 mm long, 0.5–2 mm wide, sessile, acute, cottony-villous, lower ones somewhat broader and more leaf-like; bracteoles linear, 2–6 mm long, 0.5 mm wide, cottony-pubescent. *Sepals* linear-deltoid, 7–8 mm long, 0.5–0.8 mm wide, acute, entire, cottony-pubescent on both surfaces, adnate to ovary almost to its summit. *Corolla* blue, with yellowish throat, 15–18 mm long, glabrous outside, with very few short hairs and rows of enations inside, auriculate; anterior pouch indistinct, ½–⅔ as long as ovary; tube c. 3 mm long; superior lobes oblong-oblanceolate, 15 mm long, 2 mm wide; inferior lobes oblong, 8–9 mm long, 2.5 mm wide; wings c. 3 mm wide; connate part of inferior lobes 8–10 mm long. *Stamen* filaments linear, c. 4 mm long; anthers narrow-oblong, 1.5 mm long. *Ovary* cottony-villous; septum almost as long as loculus; ovules c. 40; style 6 mm long, villous-pubescent; indusium suborbicular, c. 2 mm diam.,

brownish, villous-pubescent, with a curved orifice beset with white bristles c. 0.5 mm long. *Fruit* and seed unknown.

RANGE: Known only from the type collection.

HABITAT: Unknown.

DISCUSSION: This species shows some similarity to *G. incana*, from which it can easily be distinguished by the glabrous outer surface of the corolla.

The species epithet probably commemorates Dick Perry, a forester who spent some time in the field with C.A. Gardner, including the Bunjil area (Maslin, pers. comm.).

G. incana *R. Br.*, Prodr.: 578 (1810).

LECTOTYPE: WESTERN AUSTRALIA: Bay 1, South Coast, *R. Brown*, 7 Jan. 1804; (BM). ISOLECTOTYPE: K.* The lectotype is mounted on the same sheet as 'Chotarup, F.V. Mueller' & 'Drummond 3 Coll. no. 155'.

G. pterigosperma *R. Br.*, Prodr.: 578 (1810).

ORTHOGRAPHIC VARIANT: *G. pterygosperma* Vriese, Natuurk. Verh. Holl. Maatsch. Wetensch. Haarlem ser. 2, 10: 153 (1854).

LECTOTYPE: WESTERN AUSTRALIA: Bay I (Lucky Bay) South Coast, *R. Brown*, 12 Jan. 1802 (BM). ISOLECTOTYPE: (K).* The isolectotype of *G. pterigosperma* at K contains a fragment of another species which I have been unable to identify with certainty.

G. cyanea F. Muell., Fragm. 1: 155 (1859) = **G. pterigosperma** *R. Br.*

LECTOTYPE: WESTERN AUSTRALIA: [Phillip's Range], *Maxwell* (K). PARALECTOTYPES: uncertain. There are no specimens from Phillips Range, the locality given in the protologue, which have been labelled *G. cyanea* by Mueller. The closest to it seems to be the specimen at K, labelled by Mueller, from S.W. Australia. Mueller probably used other material, which was subsequently labelled *'G. pterygosperma'*, for his description of *G. cyanea*, before sending it to Kew for Bentham to use in Flora Australiensis. The specimen selected as the lectotype is labelled *G. cyanea* in Mueller's handwriting, and agrees with his description.

G. glareicola *Carolin*, **sp. nov.**

Herba erecta caulorrhiza basibus emortuis foliarum obtecta. Scapi glabri ad 30 cm. Folia basalia linearia usque oblanceolata crassa glabra integra obtusa sessilia. Flores in racemis terminalibus dispositi. Sepala lanceolata 1.5–4 mm longa glabra. Corolla coerulea sed flava in fauce ad 15 mm longa glabra extus et intus atque seriebus cnationum auriculata sacco angusto ovarium aequans. Ovarium glabrum stylo villoso indusioque latissimo obovato. Fructus ovoideus 8–9 mm longus plerumque quatuor valvis dehiscens. Semina plana brunnea reticulata elliptica ala lata hyalina.

HOLOTYPE: WESTERN AUSTRALIA: Near Newdegate, *W.E. Blackall 1364*, 18 Nov. 1931 (PERTH).

Glabrous often glaucous erect perennial herb with thickened stock surrounded by dead leaf-bases, with slightly thickened tap-root. *Scapes* terete or slightly angular when young, to 30 cm high, 2–3 mm thick. *Basal leaves* thick, linear to oblanceolate, 20–30 mm long, 2–4 mm wide, sessile with broadened base, entire, glabrous except for some villous wool in axils; upper leaves becoming smaller. *Flowers* in terminal racemes, lower peduncles occasionally bearing two flowers; peduncles 8–20 mm long; bracteoles linear-lanceolate, 2.5–3 mm long; pedicels 5–14 mm long, articulate c. 1.5 mm below ovary. *Sepals* lanceolate,

1–4 mm long, acute, adnate to ovary almost to its summit. *Corolla* blue, yellow in throat, c. 15 mm long, glabrous outside, with some very short hairs and obscure enations inside, auriculate; anterior pocket narrow but as long as ovary; tube 2–3 mm long; superior lobes narrow-oblong to oblanceolate, 7–7.5 mm long, c. 1.5 mm wide; inferior lobes narrow-ovate, 6.5–7 mm long, to 2 mm wide; wings 2–2.5 mm wide; connate part of inferior lobes 4.5–5 mm wide. *Stamen* filaments linear, 2.5 mm long; anthers oblong, 1.5 mm long. *Ovary* glabrous; septum nearly as long as loculus; style to 6 mm long, villous; indusium broad-ovate, 1.5 mm long, 2 mm wide, brownish, with a slightly curved orifice beset with bristles c. 0.4 mm long which are purplish at tips. *Fruit* ovoid, 8–9 mm long, 2-valved to base, each valve often bifid. *Seeds* flat, brown, elliptic, 2 mm long, reticulate; wing hyaline, c. 0.7 mm wide.

RANGE: Hyden to Tammin, Western Australia.

HABITAT: Gravelly sands.

DISCUSSION: The lack of hairs and the broad hyaline wing on the seed distinguish this species from other members of sect. *Coerulea.*

SELECTED SPECIMENS (23): WESTERN AUSTRALIA: Bundering, *C.A. Gardner 2026*, 15 Nov. 1923 (PERTH); 16 miles (25.6 km) N of Lake Biddy, *W.E. Blackall 1364*, 18 Nov. 1931 (PERTH); Frank Hann National Park, *R.D. Royce 10199*, 10 Dec. 1971 (PERTH); Tammin, *C.A. Gardner 12116*, 26 Nov. 1953 (PERTH); 12 miles (19.2 km) W of Ballidu, *J.W. Green 768*, 3 Nov. 1956 (PERTH).

Named after the gravelly soils in which this species is sometimes found. Latin, *glarea* = gravel, *-icola* = living in.

G. eatoniana *F. Muell.*, Fragm. 8: 186 (1874)

LECTOTYPE: WESTERN AUSTRALIA: Blackwood River, *Jas. Forrest* (MEL 22369). PROBABLE ISOLECTOTYPE: K.* Mueller simply cites 'In Australia extratropica occidentali ad flumen Blackwood River'. There are a number of collections from the Blackwood River but of these it would seem that only that of John Forrest, who was in that area in 1870, was actually made before Mueller's description in 1873. One of these sheets is therefore selected as the lectotype. The collector's name on the herbarium label 'Jas. Forest' is presumably a mistake for 'John Forrest'.

G. hassallii *F. Muell.*, Fragm. 6: 10 (1867).

LECTOTYPE: WESTERN AUSTRALIA: In Australis occidentali, *Drummond s.n.* (MEL) 24091. ISOLECTOTYPE: K. MEL 24006*

G. nigrescens *Carolin*, **sp. nov.**

Herba erecta usque 20 cm alta nigrescens vel memnonia si siccata. Folia anguste oblonga vel oblanceolata 2–5 cm longa glabra vel strigosa integra vel dentata versus basin sensim in petiolum contracta. Flores in racemis terminalibus dispositi bracteis foliosis sed linearibus. Pedunculi 5–18 mm longi bracteolis linearibus duabus circa 2–3 mm infra ovario insertis. Sepala linearilanceolata vel anguste elliptica 4–5 mm longa. Corolla ochracea pubescens simpliciter et glandulose extus et villosis enationibus pilis fere occultis intus. Capsula ovoido-cylindrica usque 1.5 cm longa glabrescens duabus valvis ad basim dehiscens. Semina orbicularia usque 3 mm in diametro reticulata ala angusta.

HOLOTYPE: NORTHERN TERRITORY: 28 miles (44.8 km) NE of Banka Banka, *G. Chippendale*, 16 June 1960 (NT 7023).

Erect perennial or annual herb to 20 cm, becoming dark-brown or black when dried, with a branched stock c. 0.3 mm wide. *Stems* compressed, distinctly

ridged, glabrous. *Leaves* scattered on stem, narrow-oblong to oblanceolate, 2–5 cm long, 3–5 mm wide, narrowing very gradually towards base, entire dentate or lobed, obtuse, glabrous or with minute glandular hairs when young, with a tuft of villous axillary hairs. *Flowers* in terminal racemes; bracts linear, to 5 cm long, to 3 mm wide at base of raceme but mostly c. 3 mm long and 1 mm wide, entire or dentate, glabrous; peduncles 5–18 mm long, glabrous; bracteoles linear, 2–3 mm long, c. 0.5 mm wide, glabrous or with few appressed simple hairs, sometimes not exactly opposite; pedicels 1–2 mm long, glabrous, articulate. *Sepals* linear-lanceolate to elliptic or narrow-elliptic, 4–5 mm long, 0.5 mm wide, acute, entire, nearly glabrous but usually with very few appressed simple and glandular hairs, adnate to ovary for ¾ its length. *Corolla* deep yellow, brownish in throat, c. 18 mm long, densely pubescent outside with glandular and simple hairs, with villous-pubescent hairs arranged in basally widening zones and obscure enations almost hidden by hairs which frequently surmount them inside, auriculate; anterior pouch scarcely as long as ovary; tube 1–2 mm long; superior lobes narrow-oblong, c. 10 mm long, c. 1 mm wide, winged on upper margin only, barbulate on lower margin; inferior lobes oblong, mm long, 2–2.5 mm wide; wings 2–2.8 mm wide; connate part of inferior lobes 6–7 mm long. *Stamen* filaments linear, 2.5 mm long; anthers oblong, 1.5 mm long. *Ovary* with a few scattered appressed simple and glandular hairs; septum c. ⅔ as long as loculus; ovules c. 30; style 3.5–4 mm long, glabrous; indusium oblong-ovate, 2.5 mm long, 1.5–2 mm wide, sprinkled with villous hairs, concave to slightly folded, with a curved orifice beset with white bristles c. 0.5 mm long on upper lip and shorter ones on lower lip. *Fruit* ovoid-cylindrical, ± compressed, 1.2–1.5 cm long, 0.4–0.5 cm wide, almost glabrous, 2-valved to base, each valve entire. *Seeds* flat, brown, orbicular, 4.3 mm diam., reticulate-foveate, with an obscure rim; wing 0.2–0.3 mm wide.

RANGE: Barkly Tablelands in the Northern Territory.

HABITAT: Grey soils.

DISCUSSION: This species is distinguished from others which have strigose hairs and bracteoles, by the narrow indusium, the glandular pubescence on the outside of the corolla, the lack of a lower wing on the superior corolla lobes and the narrow wing on the seed.

SPECIMENS EXAMINED: NORTHERN TERRITORY: 7 miles (11.2 km) N of Brunchilly, *G. Chippendale*, 17 June 1960 (NT 7064); 17 miles (27.2 km) NW of Brunette Downs HS., *G. Chippendale*, s.d. (NT 5017); 28 miles (44.8 km) NE of Alexandria Stn. HS., *C.S. Christian 1545*, 15 June 1948 (CANB 109464).

Named from its showing a marked tendency to blacken when dried. Latin, *nigrescens* = becoming black.

G. fascicularis *F. Muell. & Tate*, Trans. & Proc. Roy. Soc. South Australia 13: 108 (1890).

HOLOTYPE: SOUTH AUSTRALIA: Basedow Ranges, *Tietkens*, 1889 (MEL). This name has been overlooked until recently. Unfortunately it predates the name previously used for this species, viz. *G. subintegra*. The type of *G. fascicularis* is a poor specimen with linear basal leaves and villous hairs on the back of the indusium. Many other specimens also have villous hairs on the indusium despite the numerous statements in the literature to the contrary.

G. subintegra F. Muell. ex J. Black, Trans. & Proc. Roy. Soc. South Australia 51: 383 (1927) = **G. fascicularis** *F. Muell. & Tate.*

LECTOTYPE: NEW SOUTH WALES: Darling River, *Dallachy* (K). This is the same specimen chosen as the lectotype for *G. glauca* var. *sericea* Benth. Mueller in Victorian Naturalist 5: 13 (1888) writes 'This plant to which as a mere variety or as a distinct species the name subintegra may be assigned. . . . .' This, of course, is not valid publication. Black cites no specimens but refers to Mueller's statement given here. I am therefore accepting that *G. subintegra* is *G. glauca* var. *sericea* Benth., raised to specific rank.

G. glauca var. *sericea* Benth., Fl. Austral. 4: 77 (1868) = **G. fascicularis** *F. Muell. & Tate.*

LECTOTYPE: NEW SOUTH WALES: Darling River, *Dallachy* (K). PARALECTOTYPES: Sturt's Creek and Dawson River, *F. Mueller* (MEL 23532); In the Interior, *Mitchell* (K, MEL 23562); Plains of the Condamine, *Leichhardt* (MEL 23551?); Armadillo, *W. Barton* (MEL 23554, NSW 76573). Bentham only makes indirect reference to specimens he referred to this species, but there are two labelled by him with Flora Australiensis labels at K. One of these has been selected as the lectotype.

G. glauca *F. Muell.*, Trans. & Proc. Victorian Inst. Advancem. Sci.: 40 (1855).

LECTOTYPE: VICTORIA: On the grassy banks of the Avoca, *s. c.*, s.d. (MEL). PARALECTOTYPES: K, MEL. There are several sheets from this locality in MEL and it is not clear if they are from the same collection. One I have marked as the lectotype.

G. lunata *J. Black*, Trans. & Proc. Roy. Soc. South Australia 51: 384 (1927).

LECTOTYPE: SOUTH AUSTRALIA: Cordillo Downs, *J.B. Cleland*, 27 May 1924 (AD97006372). PARALECTOTYPES: Macumba River, *J.B. Cleland* (AD); Alberga River, *H.W. Andrews* (AD97006371). The typification of *G. lunata* presents a serious problem. The specimens from Black's herbarium labelled with this name are poor, none of them having intact indusia which bear the characters that distinguish the species. There is, however, a drawing of an indusium on AD 97006371 which makes it clear that this, at any rate, was taken from a specimen of *G. lunata*. Unfortunately two specimens are mounted on this sheet with the note, by someone other than J. Black, that it was difficult to decide which specimen belonged to which label. In fact one of these labels is not cited by Black and therefore that collection has no claim to any sort of type status: this drawing is most probably from the non-type material. The only specimen that one can be sure has type status, i.e. the one sheet AD 97006372, is a very poor specimen with no flowers and no drawings of flowers. There appears to be no choice but to select this as the lectotype.

G. argentea J. Black, op. cit.: 384 (1927) = **G. lunata** *J. Black*

LECTOTYPE: SOUTH AUSTRALIA: Strangeways Springs, *W.L. Cleland*, no date (AD 96845153). ISOLECTOTYPE: K. PARALECTOTYPE: Yadlakina Soak (east of Lake Torrens), *s.c.* (AD).

G. pascua *Carolin*, **sp. nov.**

Herba strigosa erecta vel ascendens usque 50 cm. Folia anguste elliptica vel oblanceolata 4–8 cm longa integra vel dentata versus basim sensim in petiolum contracta et in rosulis disposita. Flores in racemis terminalibus laxis vel subumbellatim dispositi pedunculis ebracteolatis articulatis. Septum ovarii breve. Lobi inferiores corollae alis inaequalibus. Capsula ovoido-ellipsoidea duabus valvis integris dehiscens. Semina elliptica reticulata brunnea, ala 0.3–0.4 mm lata.

HOLOTYPE: WESTERN AUSTRALIA: 11 miles (17.6 km) from Roeburne on Port Hedland road, *R.C. Carolin 7894*, 14 Aug. 1970 (NSW).

Ascending to erect herb, with short stock and thin tap-root, with strigose simple hairs. *Scapes* terete, to 50 cm long. *Leaves* mostly basal, spreading, narrow-elliptic-oblanceolate, 4–8 cm long, 5-10 mm wide, tapering very gradually towards base, entire to dentate, with strigose hairs and long cottony multicellular hairs the latter becoming less frequent with age, with a small tuft of villous axillary hairs; cauline leaves much smaller and narrower. *Flowers* in terminal racemes or subumbels; bracts mostly linear, 2–12 mm long, to 1 mm wide; peduncles 2–4 cm long, articulate c. 1 mm below ovary; bracteoles absent. *Sepals* lanceolate, c. 2 mm long, adnate to ovary for ⅔–¾ of its length. *Corolla* yellow with brownish markings in throat, 8–10 mm long, strigose outside, with a few villous hairs inside particularly in throat, auriculate; anterior pocket distinct, ½–⅔ as long as ovary; tube 2–2.5 mm long; superior lobes narrow-oblong, 5–5.5 mm long, 1–1.5 mm wide; inferior lobes ovate-oblong, 4–4.5 mm long, c. 1.5 mm wide; wings c. 1.5 mm wide, wing above auricle 0.5 mm wide and c. ⅔ as long as lobe; connate part of inferior lobes 3–3.5 mm long. *Stamen* filaments 1.5 mm long; anthers oblong, 1 mm long. *Ovary* strigose; septum c. ½ as long as loculus; ovules 23–35; style c. 3 mm long; indusium square to transverse-elliptic, to 1.7 mm long, to 2 mm wide, brownish, slightly convex, pubescent on both surfaces, with a ± concave orifice beset with white bristles c. 0.3 mm long. *Fruit* ovoid-ellipsoid, sightly compressed, 2-valved to the base, each valve entire. *Seeds* flat, brown, elliptic, c. 3 mm long, reticulate; wing pale brown, to 0.5 mm wide.

RANGE: North-western Australia west of the Great Sandy Desert.

HABITAT: Grassy plains on heavy soils.

DISCUSSION: The size and shape of the fruit and, in particular, the unequal wings on the superior corolla lobes of this species separate it from *G. glauca* and its allies, although the indumenta are very similar.

SPECIMENS EXAMINED: WESTERN AUSTRALIA: 50 miles (80 km) from Onslow on Roebourne road, *R.C. Carolin 7859*, 11 Aug. 1970 (SYD, PERTH); 127 miles (203 km) from Onslow on Roebourne road, *R.C. Carolin 7846*, 11 Aug. 1970 (SYD); 322 miles (51.2 km) from Dampier on Onslow road, *R.C. Carolin 7886*, 12 Aug. 1970 (SYD); 21 miles (33.6 km) N of Sandy Creek on Rabbit Proof Fence, *R.D. Royce 1687*, 15 May 1947 (PERTH).

Named after its habitat in open grassy plains. Latin, *pascuus* = relating to pastures.

G. heteromera *F. Muell.*, Fragm. 1: 115 (1858).

LECTOTYPE: VICTORIA?: In moist grassy places on the Murray River, *s.c.*, s.d. (MEL 23624). PARALECTOTYPES: The protologue gives Murray, Darling and Avoca Rivers. There are a number of specimens at MEL collected on these Rivers which would have been available to Mueller when he cast the diagnosis: the one selected is the most complete of these specimens.

G. tenella *R. Br.*, Prodr.: 577 (1810) non *Andr.*, Bot. Repos. 7: t.466 (1807), nom. superfl.

HOLOTYPE: WESTERN AUSTRALIA: King George's Sound, *Mr. Bauer* (BM). ISOTYPE: K. *G. tenella* Andr. is fortunately a superfluous name since Andrews writes '... and is by Labillardère figured under the title of Velleia trinervis'.

G. tenella var. *major* Benth., Fl. Austral. 4: 74 (1868) = **G. tenella** *R. Br.*

LECTOTYPE: WESTERN AUSTRALIA: Don River, *Maxwell* (K). ISOLECTOTYPE: MEL. PARALECTOTYPES: Karridale, Herb. F. Mueller (MEL).

G. anfracta *J. Black*, Trans & Proc. Roy. Soc. South Australia 51: 385 (1927).

HOLOTYPE: SOUTH AUSTRALIA: Cootanoorina, *R. Helms*, May 1891 (AD 96620136). AD 96845148 is probably a dissected flower from the holotype with notes and drawings.

G. coronopifolia *R. Br.*, Prodr.: 576 (1810).

LECTOTYPE: NORTHERN TERRITORY: Carpentaria Island 5 (i.e. Morgan's Island), *R. Brown*, 20–21 Jan. 1803 (BM). ISOLECTOTYPES: MEL 23310, 23312, 23309, P, K.* The specimen MEL 23311 labelled 'North Coast, 1803, *R. Brown*' may also be an isotype.

Although this name is given in Blackall & Grieve, How to Know W. Australian Wildflowers 431 (1956), it is not clear to which species it refers. Since *G. coronopifolia* is not so far recorded from the area covered by their work, it is doubtful if they were, in fact, referring to *G. coronopifolia*. Even more doubtful is the reference to this species by Christensen & Ostenfeld, Det. Kgl. Dan. Selsk., Biol. Medd., 3: 123 (1921) but I have not examined the specimen concerned, viz. Armadale, *Christensen & Olstenfeld 1121*, 20 Sept. 1914.

G. integerrima *Carolin*, **sp. nov.**

Herba ascendens vel decumbens usque circa 9 cm alta caulibus teretibus glabris. Folia crassa linearia usque 7 cm longa integra supra canaliculata strigosa. Flores in umbellis foliosis terminalibus dispositi pedunculis ebracteolatis circa 5 mm longis. Corolla flava sed brunnea in fauce 7 mm longa glabra extus pubescens intus in fauce. Lobi superiores corollae ala inferiore reducta auriculata. Capsula globula circa 2.5 mm diametro glabra. Semina orbicularia circa 1.5 mm diametro reticulata fumosa ala 0.3 mm lata.

HOTOTYPE: WESTERN AUSTRALIA: Lake King, *A.S. George 7291*, 3 Nov. 1965 (PERTH).

Decumbent to ascending herb to c. 9 cm. *Stems* terete, glabrous. *Leaves* thick, fasciculate, linear, to 7 cm long, 1–2 mm wide, sessile with a broadened base, acute, involute with a narrow channel on upper surface, with a few short scattered ± appressed simple hairs. *Flowers* arranged in terminal umbels; bracts leaf-like but smaller; pedicels c. 5 mm long, with very few short scattered hairs, indistinctly articulate just below ovary; bracteoles absent. *Sepals* narrow-deltoid, c. 3 mm long and 0.6 mm wide, acute, entire, glabrous, adnate to ovary for ⅔–¾ its length. *Corolla* yellow with brownish throat, c. 7 mm long, glabrous outside, ± pubescent inside in throat; anterior pocket indistinct, c. ½ as long as ovary; tube c. 2 mm long; superior lobes narrow-oblong, c. 4 mm long and 0.5 mm wide, lower wing almost obsolete above auricle; inferior lobes oblong, 2 mm long, 1 mm wide; wings c. 1 mm wide, scarcely ½ as long as lobes; connate part of inferior lobes c. 3 mm long. *Stamen* filaments linear, 1.5 mm long; anthers elliptic, 0.8 mm long. *Ovary* glabrous; septum scarcely ½ as long as loculus; ovules 6–8; style 2–2.5 mm long, pubescent towards top; indusium transverse-oblong, 0.8 mm long, 1.5 mm wide, brownish, villous-pubescent, with ± concave orifice beset with white bristles c. 2 mm long. *Fruit* globular, c. 2.5 mm diam., glabrous. *Seeds* flat, dark grey-brown, orbicular, c. 1.5 mm diam., reticulate, with prominent rim; wing c. 0.3 mm wide, mucilaginous.

RANGE: Known only from type collection.

HABITAT: (Sandy) margins of salt lakes.

DISCUSSION: This species is not closely allied to any other species, but the form of the few hairs and the seeds indicate a relationship with the *G. fascicularis* group more than with any other.

Named after the entire leaves. Latin, *integerrimus* = quite entire.

G. neogoodenia *Carolin*, **nom. nov.**

REPLACED NAME: *Neogoodenia minutiflora* Gardner & George, J. Roy. Soc. W. Australia 46:138 (1963). The epithet *'minutiflora'* is pre-occupied by *Goodenia minutiflora* F.Muell.

G. janamba *Carolin*, **sp. nov.**

Herba erecta usque 60 cm. Folia plerumque basalia ascendentes anguste oblonga ad oblanceolata 5–16 cm longa fere glabra plus minusve crassa. Flores in racemis vel subumbellatum terminaliter dispositi pedunculis ebracteolatis molliter patenter simpliciter glanduloseque pubescentibus. Corolla flava 10–15 cm longa simpliciter ac glandulose pubescens extus sparse villosa intus sacco prominentissimo. Capsula globula c. 4 mm diametro. Semina orbicularia c. 4 mm diametro nitida ala albida 1 mm lata.

HOLOTYPE: NORTHERN TERRITORY: c. 10 miles (16 km) E of South Alligator River on Oenpelli road, *R.C. Carolin 6817*, 16 May 1968 (NSW). ISOTYPE: SYD.

Erect herb with short basal stock, a narrow tap root and usually many adventitious roots. *Scapes* terete, branched, to 60 cm, glabrous or nearly so. *Leaves* mostly basal, slightly thickened, narrow-oblong to oblanceolate, 5–16 cm long, 2–7 mm wide, narrowing very gradually towards base, ± acute, with a few blunt teeth on margin, glabrous except for some simple hairs towards base. *Flowers* in terminal umbels or racemes; bracts linear, 4–7 mm long, entire, with a few scattered simple hairs; peduncles 2–5 cm long, with soft simple patent hairs and minute glandular ones especially towards top, articulate c. 1 mm below ovary; bracteoles absent. *Sepals* deltoid, c. 0.5 mm long and 0.3 mm wide, acute, entire, simple- and glandular-pubescent, adnate to ovary for c. ⅔ its length. *Corolla* yellow, 10–15 mm long, simple- and glandular-pubescent outside, with some scattered villous hairs inside especially on connate part of inferior lobes, auriculate; anterior pouch very prominent, almost as long as ovary; tube 3–4 mm long; superior lobes narrow-oblong, 5–8 mm long, c. 1 mm wide; inferior lobes oblong, 3–6 mm long, 1 mm wide; wings 1 mm wide, c. ⅔ as long as lobes; connate part of inferior lobes 4–5 mm long. *Stamen* filaments linear, c. 1.5 mm long; anthers oblong, c. 0.5 mm long. *Ovary* glandular- and simple-pubescent; septum c. ½ as long as loculus; ovules 10–12; style c. 5 mm long, glabrous or nearly so; indusium obtriangular, c. 1 mm long, c. 2 mm wide, brownish, villous-pubescent especially on upper surface, with an almost straight orifice beset with short white bristles c. 0.1 mm long on upper lip and much longer (0.5 mm) on lower lip of which the longest ones are reflexed. *Fruit* globular, ± compressed, c. 4 mm diam., glandular- and simple-pubescent, 2-valved but not to base, each valve entire. *Seeds* flat, yellowish, orbicular, c. 4 mm diam., smooth, glossy, reticulate-foveate, with a distinct rim; wing 1 mm wide, whitish.

RANGE: Darwin–Gulf District of Northern Territory and the Croydon area of Queensland.

HABITAT: Savannah woodlands on sands and stony hillsides.

SELECTED SPECIMENS (15): NORTHERN TERRITORY: Port Darwin, *M. Holtze 702*, Oct. 1888 (MEL 22261); 1 mile (1.6 km) N of Adelaide River township, *N. Byrnes NB650*, 1 May 1968 (NT 14381, SYD); Goodparla Stn., *R.C. Carolin 6789*, 15 May 1968 (SYD); c. 5 miles (8 km) E of Mary River on Oenpelli to Pine Creek road, *R.C. Carolin 6748*, 14 July 1968 (SYD); 30 miles (48 km) E of Berwick Hs., *R.C. Carolin 9362*, 21 May 1974 (SYD); 22 miles (35.2 km) from Boroloola on road to Daly Waters, *R.C. Carolin 9310*, 18 May 1974 (SYD). QUEENSLAND: 44 miles (70.4 km) E. of Croydon on Georgetown road, *R.C. Carolin 8612*, 15 April 1974 (SYD).

'Janamba' is an Aboriginal word meaning crocodile and this species is named for the South Alligator River, near which the type specimen was collected.

G. strangfordii *F. Muell.*, Fragm. 6: 11 (1867).

LECTOTYPE: QUEENSLAND: Lara, Flinders River, *Kennedy* (MEL 23739). PARALECTOTYPE: Upper Victoria River, *F. Mueller* (K, MEL 23744). Mueller gives 'In locis ripariis a fluvo Victoriae usque ad rivum Flindersii'. The specimen from the Flinders River at MEL agrees with the illustration accompanying the type description much better than the Victoria River specimen at Kew even to the point of possessing the rare feature in this species of a bracteolate peduncle. This is therefore selected as the lectotype.

G. pusilliflora *F. Muell.*, Victorian Naturalist 5: 11 (1888).

LECTOTYPE: NEW SOUTH WALES?: Junction of Murray and Darling Rivers, *Mrs. Holding*, July 1887 (MEL 23136). PARALECTOTYPES: Yorkes Peninsula, *O. Tepper* (MEL 23140, 23141, 23146); Near the Broughton River, *L. Wehl* (MEL 23154); Richardsons Creek, *Curdie* (MEL 23138); Wimmera, *D. Sullivan* (MEL 23149); Lake Coorong, *C. Walter* (MEL 23137); Looma Rapids, *Cambell* (MEL 23130); Lake Albacutya, *C. French* (MEL 23134, 23135, 23142); Edwards River, *F. Mueller* (MEL 23129?); Murrumbidgee, *Lucas* (MEL 23139?, 23147?, 23148?); Tarella, *W. Baneuerlen* (MEL); Near Flinders Range, *F. Mueller* [not located], Near Mt. Perry, *Tate* (MEL); Darling River, *Brueckner* (MEL); Lachlan River, *F. Mueller* (MEL)]. The description in Victorian Naturalist appears to be the first since it was published in May 1888. Mueller's description in Bot. Centralbl. 35: 99 (1888) is virtually a copy of it and seems to have been published later in the same year. Mueller also described this species in his Key to the System of Victorian Plants which was published between November and December 1888.

G. calogynoides E. Pritzel, Bot. Jahrb. Syst. 35: 560 (1905) = **G. pusilliflora** *F. Muell.*

LECTOTYPE: WESTERN AUSTRALIA: District Avon, bei Newcastle, *E. Pritzel 550*, Aug. 1901 (BM). PARALECTOTYPE: Newcastle, *Diels 3907* (B destroyed). Despite Krause's distinction between *G. pusilliflora* and *G. calogynoides*, 'Indusium integrum' and 'Indusium bilobum' respectively, the two may not be different. In fact *G. pusilliflora* has a cleft indusium, certainly never quite entire, and Mueller himself drew attention to it '... slightly contracted in the middle so as to indicate some approach to that of Calogyne .....'.

G. phillipsiae *Carolin*, **sp. nov.**

Suffrutex erectus vel ascendens usque 30 cm. Folia caulina crassa anguste oblonga vel linearia usque 4 cm longa sessilia glabra integra. Flores in thyrsis terminalibus dispositi pedunculis bracteolatis arcuatis 15–30 mm longis. Corolla flava 10–12 mm longa extus glabra intus conferte hirsuta sacco prominenti et lobis inaequalibus late alatis. Ovarium glabrum septo loculum fere aequanti.

HOLOTYPE: WESTERN AUSTRALIA: 19 miles (30.4 km) E of Ravensthorpe, *M.E. Phillips*, 3 Nov. 1962 (PERTH).

Erect to spreading suffruticose perennial to 30 cm. *Stems* obscurely ridged to terete, glabrous. Cauline leaves thick, narrow-oblong to linear, to 4 cm long, to 3 mm wide, sessile, entire, glabrous. *Flowers* in complex terminal thyrses; bracts similar to cauline leaves but smaller; peduncles 15–30 mm long, glabrous, arcuate; bracteoles thick, linear, to 10 mm long, c. 0.5 mm wide, glabrous, acute; pedicels similar to peduncles but shorter; partial inflorescences often many-flowered. *Sepals* elliptic-lanceolate, 2 mm long, 0.5 mm wide, acute, glabrous, adnate to ovary for almost its whole length. *Corolla* yellow (?), 10–12 mm long, glabrous outside but with a dense beard inside at base of

inferior lobes and then pubescent below, scarcely auriculate; anterior pouch prominent, c. ⅓ as long as ovary; tube 4.5–5 mm long; superior lobes oblong, c. 8 mm long, c. 1.8 mm wide; inferior lobes oblong, c. 6 mm long, c. 1.5 mm wide; wings c. 1.5 mm wide; connate part of inferior lobes c. 5 mm long. *Stamen* filaments c. 2.5 mm long; anthers oblong, 1.5 mm long. *Ovary* glabrous; septum almost as long as loculus; ovules 45–50; style c. 5 mm long, villous; indusium depressed-obovate, 1 mm long, 2 mm wide, pubescent at base particularly on posterior side, with a slightly curved orifice beset with white bristles c. 0.4 mm long. *Fruit* and seed unknown.

RANGE: Known only from the type collection.

HABITAT: Unknown.

DISCUSSION: A species of uncertain relationship until more is known about its morphology and distribution. The bracteolate inflorescence with arcuate peduncles and pedicels appears to be diagnostic. The beard on the corolla points to a relationship with *G. pinnatifida* but the presence of bracteoles is unusual in the group centred on that species.

Named for the late Marie E. Phillips, the collector of the holotype, formerly of the Australian National Botanic Gardens in Canberra.

G. glauca F. Muell. var. *glandulosa* Benth., Fl. Austral. 4: 77 (1868) = **G. berardiana** *(Gaudich.) Carolin*

LECTOTYPE: NEW SOUTH WALES: Darling River, *Dallachy* (K). PARALECTOTYPE: Goyinga Mountains, *Vict. Expl. Expedition* (MEL 24170). The lectotype is the only specimen at K labelled var. *glandulosa* which has been annotated by Bentham. The only specimen at K from the Goyinga Mountains is a specimen of *G. fascicularis*.

Calogyne linearis S. Moore, J. Linn. Soc., Bot. 45: 185 (1920) = **G. berardiana** *(Gaudich.) Carolin*

LECTOTYPE: WESTERN AUSTRALIA: Kununoppin, *Stoward 307* (BM). PARALECTOTYPE: Kauring, *G.W. Brown* ex herb. Stoward (BM).

G. ochracea *Carolin*, **sp. nov.**

Herba decumbens stolonifera. Folia oblanceolata 2–3 cm longa pubescentes fasciculata dentata pilis glandulosis et antrorso-simplicibus. Flores in racemis foliosis dispositi pedunculis 8–15 mm longis ebracteolatis pubescentibus glandulosis. Corolla ochracea 15–16 mm longa pubescens glandulose et simpliciter extus glabra intus sacco prominenti. Stylus bifidus. Capsula globula 6 mm diametro valvis duabus dehiscens. Semina orbiculata nigra reticulata ala angustissima straminea.

HOLOTYPE: WESTERN AUSTRALIA: Shark Bay, *C.A. Gardner*, Aug. 1932 (K).

Decumbent, stoloniferous herb to 15 cm long with a short stock. *Leaves* clustered near base of scapes on stolons or stock, oblanceolate, mostly 3–6 cm long, 4–8 mm wide, tapering very gradually into an indistinct petiole, dentate, glandular-pubescent, with some antrorse simple hairs on midvein on undersurface; a few smaller leaves present on scapes. *Flowers* in racemes often with zig-zag axis; bracts narrow-oblong to narrow-elliptic, 4–7 mm long, 1–2 mm wide, glandular-pubescent, dentate to entire; peduncles 8–15 mm long, glandular-pubescent, indistinctly articulate; bracteoles absent. *Sepals* narrow-oblong to narrow-elliptic, 4–5 mm long, 1–1.5 mm wide, acute, entire, glandular-pubescent, adnate to ovary for ½–⅔ its length. *Corolla* 'rich' yellow,

15–16 mm long, glandular-pubescent, with some scattered simple hairs outside, almost glabrous inside, auriculate; anterior pocket prominent, as long as ovary or nearly so; tube c. 2 mm long; superior lobes narrow-oblong, c. 10 mm long, 1.5–2 mm wide; inferior lobes oblanceolate, 8–9 mm long, 2–2.5 mm wide with wings to 2 mm wide, c. ⅔ as long as lobes; connate part of inferior lobes 4–5 mm long. *Stamen* filaments linear, c. 3 mm long; anthers oblong, 1.5 mm long. *Ovary* glandular-pubescent; septum scarcely ½ as long as loculus; ovules 20; style bifid, c. 8 mm long, each branch (including indusium) c. 5 mm long; each half-indusium oblong, 1.5 mm long, with a ± lateral orifice beset with pale-brown bristles c. 0.2 mm long. *Fruit* globular, c. 6 mm diam., glandular-pubescent, 2-valved to base. *Seeds* black, orbicular, c. 2 mm diam., reticulate-foveate, with a ± distinct rim; wing c. 0.1 mm wide, brownish.

RANGE: Carnarvon area of Western Australia.

HABITAT: Sandy soil.

DISCUSSION: The closest relative of this species is probably *G. berardiana* but it can be distinguished quite easily by the broader sepals, much more distinct anterior pocket of the corolla and the almost obsolete wing of the seed.

SPECIMENS EXAMINED: WESTERN AUSTRALIA: 7 miles (11.2 km) N of Quobba H.S., *A.S. George 10159* (PERTH); 4 km N of Herald Bay outcamp, Dirk Hartog Island, *A.S. George* 11508 (PERTH).

The specific epithet refers to the colour of the corolla. Latin, *ochraceus* = ochre yellow.

G. elongata *Labill.*, Nov. Holl. Pl. 1: 52 (1804).

LECTOTYPE: WESTERN AUSTRALIA: Habitat in Capite Van Diemen, *Labillardière* (P, donné par *M. Webb*). ISOLECTOTYPE: BM, FI.*

G. salmoniana (*F. Muell.*) *Carolin*, **comb. nov.**

BASIONYM: *Velleia salmoniana* F. Muell., Victorian Naturalist 9: 127 (1892).

HOLOTYPE: WESTERN AUSTRALIA: Gascoyne River, *Mrs Forrest*, 1889 (MEL 9812). There are two specimens at MEL (see below) but only one bears the citation as given by Mueller (the collector having become Lady Margaret Forrest in the interval between collection and description).

Mueller, in placing this species in *Velleia*, was impressed by the sepals being almost free from the inner floral whorls. However, the inflorescence is clearly that of *Goodenia* and the corolla is adnate to the ovary. Moreover, there are a number of other *Goodenia* species in which the sepals are almost free from the ovary.

G. filiformis *R. Br.*, Prodr.: 578 (1810).

LECTOTYPE: WESTERN AUSTRALIA: Inter Princess Royal Harbour and Cape Howe, Prope Portum Regis Georgii III, *R. Brown*, 18 Dec. 1801 (BM). ISOLECTOTYPE: K.*

G. filiformis var. *hirsuta* K. Krause, Pflanzenr. 54: 86 (1912) = **G. filiformis** *R. Br.*

LECTOTYPE: WESTERN AUSTRALIA: *Drummond 185* (K). ISOLECTOTYPES: BM, MEL 23640, P.*

G. krauseana *Carolin*, **nom. nov.**

REPLACED NAME: *G. nana* K. Krause, Pflanzenr. 54: 80 (1912) non Vriese, Natuurk. Verh. Holl. Maatsch. Wetensch. Haarlem ser. 2 10: 132 (1854).

G. concinna *Benth.*, Fl. Austral. 4: 76 (1868).Lectotype: Western Australia: Eyre's Relief, *Maxwell* (K). Isolectotype: (MEL 23674). Paralectotypes: *Drummond 360* (K); Point Henry, *Oldfield* (MEL); E. Mount Barren, *Maxwell* (K); Phillips and Fitzgeralds Ranges, *Maxwell* (K, MEL 23673).

G. micrantha *Hemsley ex Carolin*, **nom. et stat. nov.**

Replaced Name: *G. filiformis* var. *minutiflora* F. Muell. ex K. Krause, Pflanzenr. 54: 86 (1912). Mueller did not publish the varietal epithet. His statement in Fragm. 8: 245 (1874): 'G. filiformis nonnumquam varietatem minutifloram producit' is not a valid publication of this variety and therefore the first valid publication is due to Krause. Since Christensen and Ostenfeld, Vid. Selsk. Biol. Medd. 3: 124 (1921) refer only to Mueller's invalid statement when they rename it *G. micrantha* Hemsl. ined., their binomial is invalid.

G. havilandii *Maiden & Betche*, Proc. Linn. Soc. New South Wales 38: 250 (1913) (as *G. havilandi*).

Lectotype: New South Wales: Cobar, *F.E. Haviland*, Sept. 1911 (NSW).

G. macroplectra (*F. Muell.*) *Carolin*, **comb. nov.**

Basionym: *Velleia macroplectra* F. Muell., Fragm. 12: 22 (1882). *Symphyobasis macroplectra* (F. Muell.) K. Krause, Pflanzenr. 54: 41 (1912)

Lectotype: Western Australia: Gascoyne River, *J. Forrest* (MEL). This is a similar case to that of *G. salmoniana* (see above) but, once again, the inflorescence is clearly that of *Goodenia* and the corolla is adnate to the top of the ovary. The recognition of the genus *Symphyobasis* makes the genus *Goodenia* paraphyletic (Carolin, unpub.).

G. nicholsonii F. Muell., Fragm. 1: 203 (1859). = **G. cycloptera** *R. Br.*

Lectotype: South Australia: NW interior of South Australia, *Macdougall* [sic] *Stuart* (MEL 23060 pro parte). Isolectotype: K.* The sheet (MEL 23060) bears specimens of two entirely different species. Mueller's description applies only to the scraps of flowers, etc. on the right-hand side of the sheet. It seems probable that the best part of this specimen was retained at K. The type of *G. nicholsonii* was probably collected on the same expedition as that of *G. chambersii*.

G. larapinta *Tate* in Spencer, Report on the work of the Horn Scientific Exploring Expedition to Central Australia 3: 189 (1896).

Lectotype: Northern Territory: Glen Edith, *R. Tate*, June 1894 (AD). Isolectotypes: K, MEL 23785.

G. odonnellii *F. Muell.*, Australas. J. Pharm. 1: 278 (1886).

Lectotype: Western Australia: Ord River, *O'Donnell* (MEL). Isolectotypes: MEL. There are a number of sheets in MEL with this locality and I have marked one of them as the lectotype.*

G. redacta *Carolin*, **sp. nov.**

Herba ascendens vel decumbens caulibus pubescentibus molliter simpliciter ac minute glandulose usque ad 15 cm longis. Folia plerumque basalia ascendentes obovata 2.5–5 cm longa dentata obtusa pubescentia pilis simplicibus dispersis versus basim in petiolum indistinctum contracta. Flores in racemis foliosis terminalibus dispositi. Pedunculi 5–10 cm longi ebracteolati pubescentes pilis antrorsis simplicibus. Corolla flava 6–7 mm longa pubescens molliter simpliciter ac glandulose minime extus. Lobi superiores corollae exalati sed auriculati. Semina elliptica 3 mm longa reticulata brunnea sordide ala membranacea albida 0.2–0.4 mm lata.

HOLOTYPE: WESTERN AUSTRALIA: Prince Regent River, *Bradshaw & Allen*, 1891 (MEL 25769).

Ascending to decumbent herb with thin tap-root and very short stock. *Stems* terete, to 15 cm long, pubescent with soft antrorse simple hairs and some minute glandular ones. *Basal leaves* arranged in an ascending rosette, obovate, 2.5–5 cm long, 10–15 mm wide, tapering very gradually towards base into a ± distinct petiole, dentate, with some soft scattered simple hairs especially on margins and lower surface of midrib; cauline leaves smaller and becoming almost sessile. *Flowers* in terminal leafy racemes; bracts leaf-like but smaller narrower and becoming almost sessile; peduncles 5–10 mm long, pubescent with soft antrorse simple hairs and some minute glandular ones, not distinctly articulate; bracteoles absent. *Sepals* unequal in size; posterior sepal elliptic, 2–3 times as long as others; anterior and lateral sepals elliptic-oblong, 1.5–2 mm long, 0.4–0.6 mm wide, acute, entire, pubescent with soft simple hairs and minute glandular ones, adnate to ovary for c. ¾ its length. *Corolla* yellow (?), 6–7 mm long, with soft simple and minute glandular hairs outside, ± pubescent towards base inside; anterior pocket almost obsolete; tube c. 0.8 mm long; superior lobes narrow-oblong to almost linear, 2–2.5 mm long, 0.2–0.4 mm wide, tapering towards an acute point; inferior lobes ovate-oblong, 2.5 mm long, 1 mm wide; wings on superior lobes almost obsolete except for a distinct barbulate auricle, those on inferior lobes to 1 mm wide, ½–⅔ as long as lobe; connate part of inferior lobes 2.5–3 mm long. *Stamen* filaments linear, c. 0.8 mm long; anthers oblong, c. 0.6 mm long. *Ovary* pubescent; septum scarcely ⅓ as long as loculus; ovules 6–10; style c. 1.5 mm long, glabrous or nearly so; indusium very broad-obovate, 0.8 mm long, 0.8 mm wide, purplish with a few scattered hairs particularly at base on lower surface, biconvex, with a concave orifice beset with purplish bristles c. 0.2 mm long. *Fruit* globular, 3–6 mm diam., pubescent, 2-valved usually not quite to base. *Seeds* flat, greyish brown, elliptic, 3 mm long, 2.5 mm wide, reticulate-foveate, with a prominent rim; wing 0.2–0.4 mm wide, white, membranous.

RANGE: Gardner (Kimberley) District of Western Australia and Darwin–Gulf District of Northern Territory.

HABITAT: Woodlands and open communities.

DISCUSSION: The indumentum and seeds place this species fairly close to *G. odonnellii* F. Muell., but it is easily distinguished by the enlarged posterior sepal and the reduced superior corolla-lobes which bear scarcely any wings but for the auricle.

SELECTED SPECIMENS (7): WESTERN AUSTRALIA: Bindelong Creek, *E.M. Bennet 1777*, 19 May 1967 (PERTH); 9 km N of Drysdale Stn., *D.E. Symon 7090*, 28 May 1971 (AD).

Named from the reduced superior lobes of the corolla. Latin, *redactus* = reduced.

G. cirrifica *F. Muell.*, Australas. J. Pharm. 1: 81 (1886).

LECTOTYPE: NORTHERN TERRITORY: On the Alligator River, *Moritz Holtze* (MEL 23683). ISOLECTOTYPES: K, MEL 23684, NT 24267 (a fragment).* There are two sheets of this species at MEL which were collected by Holtze; only one is labelled 'Alligator River', and this is selected as the lectotype.

G. armitiana *F. Muell.*, Fragm. 10: 110 (1877).

LECTOTYPE: QUEENSLAND: Einasleigh River, *Armit 466* (MEL 23695). PARALECTOTYPE: Tait River, Gilbert River, Lynd River, *Armit* (MEL23686). Only the paralectotype bears

the label 'Lynd River' — cited by Mueller as such in his original description. Unfortunately, it does not agree with Mueller's description in that the glandular hairs are not apparent. Furthermore, the label also bears the localities 'Tait [sic] River, Gilbert River' in addition to Lynd River. There is only one specimen on the sheet. These localities thus cover a very large area and included between the Lynd and the Gilbert Rivers is the Einasleigh River (a tributary of the Gilbert), the locality of another Armit specimen which does agree with the description. It seems that Mueller had no clear idea of the locality of MEL 23686 and there is no reason for accepting it as a holotype merely because it bears the same locality as his citation, especially since it also bears other localities. In fact it must be rejected since it does not agree with the description. MEL 23695 from Einasleigh River bears the name *'G. armittiana'* [sic] in Mueller's handwriting and since it comes from the same area as designated by Mueller, I am selecting it as the lectotype.

G. linifolia *W. Fitzg.*, J. & Proc. Roy. Soc. Western Australia 3: 213 (1918).

LECTOTYPE: WESTERN AUSTRALIA: Inglis Gap, *W.V. Fitzgerald* (K). PARALECTOTYPES: Inglis Gap, King Leopold Ranges, *W.V. Fitzgerald* (NSW); Lennard River, *W.V. Fitzgerald* (NSW); Isdell River, *W.V. Fitzgerald* (NSW); Barnett River, *W.V. Fitzgerald* (NSW).

G. nuda *E. Pritzel*, Bot. Jahrb. Syst. 35: 562 (1905).

HOLOTYPE: WESTERN AUSTRALIA: Bei Spring Station, 55 km südlich von Roeburne, *Diels 2792*, April 1901 (B, destroyed). NEOTYPE: 96 miles (153.6 km) from Onslow on Mt Stuart Road, *R.C. Carolin 7788*, 10 Aug. 1970 (NSW). ISOTYPE: SYD.

G. pallida *Carolin*, **sp. nov.**

Herba ascendens ad 50 cm. Folia caulina anguste elliptica 5–7 cm longa crassa glauca dentata vel integra sessilia glabra. Flores in racemis brevibus vel umbellis dispositi. Pedunculi articulati ebracteolati pilis simplicibus ac glandulosis. Sepala lineari-deltoidea 1.5–2 mm longa. Corolla violacea pallide 14–16 mm longa pilis simplicibus ac glandulosis extra. Semina orbicularia biconvexa 4–4.5 mm in diametro brunnea reticulata ala membranacea fulva c. 1 mm lata.

HOLOTYPE: WESTERN AUSTRALIA: 127 miles (203 km) from Onslow on Roeburne road, *R.C. Carolin 7845*, 11 Aug. 1970 (NSW). ISOTYPE: SYD.

Herb with mostly cauline leaves. *Stems* to 50 cm long, pubescent when young with short patent simple hairs and brown-headed glandular hairs, glabrescent. *Leaves* thick, glaucous, narrow-elliptic, 5–7 cm long, 3–8 mm wide, tapering very gradually towards base, acute, dentate with narrow teeth or entire. *Flowers* in short terminal racemes or umbels; bracts linear, 3–6 mm long, 0.2–0.8 mm wide, entire, glandular- and simple-pubescent, with a prominent axillary tuft of white hairs; peduncles 3–4 cm long, glandular- and simple-pubescent, distinctly articulate 1–2 mm below ovary. *Sepals* linear-deltoid, 1.5–2 mm long, 0.2–0.3 mm wide, acute, entire, glandular- and simple-pubescent, adnate to ovary for ½ its length. *Corolla* pale purple, 14–16 mm long, glandular- and simple-pubescent outside, with simple hairs scattered over inside in throat and tube, auriculate; anterior pocket obscure, c. ½ as long as ovary; tube 2–2.5 mm long; superior lobes narrow-oblong-lanceolate, 7.5–8 mm long, 1.5–1.8 mm long; inferior lobes narrow-oblong, 6–6.5 mm long, 1.5 mm wide; wings to 2 mm wide, ½–⅔ as long as lobe; connate part of inferior lobes 5–6 mm long. *Stamen* filaments linear, 2.5 mm long; anthers oblong, 1.5 mm long. *Ovary* glandular- and simple-pubescent; septum c. ½ as long as loculus; ovules 15–20; style 4 mm long, glabrous; indusium transverse-ovate, 1.2 mm long, 1.2 mm wide, brownish, with a few scattered simple hairs towards base, with a slightly concave

orifice beset with white silky bristles c. 0.3 mm long. *Fruit* subglobular, 6–7 mm diam., pubescent, 2-valved eventually to base. *Seeds* flat, dark brown, orbicular, 4–4.5 mm diam., reticulate-alveolate, with a distinct rim; wing 1–1.2 mm wide, yellowish brown, membranous.

RANGE: Known only from the type collection.

HABITAT: Annual grassland in *Acacia* woodland.

DISCUSSION: This is a distinct species differing from *G. nuda*, which is possibly its nearest relative, both in the indumentum and flower color.

The specific epithet refers to the pallid purple color of the corolla. Latin, *pallidus* = pallid.

G. prostrata *Carolin*, **sp. nov.**

Herba prostrata caulibus simpliciter ac glandulose sparse pubescentibus sed glabrescentibus usque 30 cm longis. Folia basalia oblanceolata usque obovata 2–4 cm longa crassa dentata glabra vel sparsissime pubescentia versus basim in petiolum indistinctum contracta et in rosula disposita. Folia caulina parviora caespitis distinctissimis pilorum villosorum albidorum in axillis. Flores pedunculis 10–25 mm longis pubescentibus simpliciter et glandulose articulatis ebracteolatis in racemis foliosis terminalibus dispositi. Corolla flava signis brunneis in fauce 12–15 mm longa pubescens simpliciter ac glandulose extus. Semina elliptica 3 mm longa reticulata brunnea ala angusta brunnea mucilaginea.

HOLOTYPE: WESTERN AUSTRALIA: 22 miles (35.2 km) from Roy Hill on Wittenoom road, *R.C. Carolin 7702*, 7 Aug. 1970 (NSW). ISOTYPE: SYD.

Prostrate herb with a narrow tap-root and a short sometimes branched stock. *Stems* terete or ridged, to 30 cm long, with scattered simple hairs and some glandular and multicellular hairs especially in younger stages. Basal leaves ± thick, oblanceolate to obovate, 2–4 cm long, 5–10 mm wide, tapering gradually towards base into an indistinct petiole, dentate, glabrous or with a very few simple hairs, with a prominent tuft of white villous axillary hairs; cauline leaves similar but usually less dentate, smaller and narrower. *Flowers* in terminal racemes or umbels leafy at base; bracts similar to upper leaves; peduncles 10–25 mm long, pubescent with simple and glandular hairs, indistinctly articulate just below ovary; bracteoles absent. *Sepals* narrow-elliptic to elliptic-lanceolate, c. 2.5 mm long, 0.5–0.7 mm wide, acute, entire, simple- and glandular-pubescent, adnate to ovary for c. ½ its length. *Corolla* yellow with brownish markings in throat, 12–15 mm long, densely pubescent outside with simple and glandular hairs, pubescent inside below throat and extending upwards along lines of connation, auriculate; anterior pocket distinct, as long as ovary or nearly so; tube 1.5–2 mm long; superior lobes narrow-oblong, 7–8 mm long, 0.8–1.2 mm wide; inferior lobes oblong-ovate, 4.5–5 mm long, 1–1.2 mm wide; wings to 3 mm wide, as long as lobe; connate part of inferior lobes 4.5–5.5 mm long. *Stamen* filaments linear, c. 2 mm long; anthers narrow-oblong, 1 mm long. *Ovary* glandular- and simple-pubescent; septum < ⅓ as long as loculus; ovules 8–12; style c. 3 mm long, with some scattered villous hairs especially towards top; indusium transverse-oblong to transverse-ovate, 1 mm long, 2 mm wide, brownish, villous on both sides, with a slightly longer beard on lower surface, with a slightly curved orifice beset with white bristles to 0.4 mm long on upper lip and slightly shorter ones on lower lip. *Fruit* globular, only slightly compressed, 4–5 mm diam., glandular- and simple-pubescent,

2-valved to base, each valve entire. *Seeds* flat, brown, elliptic, 3 mm long, 2 mm wide, reticulate-alveolate, with a prominent rim; wing 0.2 mm wide, brownish, mucilaginous.

RANGE: Keartland, Fortescue, Ashburton and Carnarvon Districts of Western Australia.

HABITAT: *Acacia* scrubs on red sandy soil.

DISCUSSION: This species is very close to *G. muelleriana*, from which it can be distinguished by the prostrate habit, the almost glabrous mature leaves, the narrower mucilaginous wing on the seed and the very short ovary and fruit septum.

SELECTED SPECIMENS (14): WESTERN AUSTRALIA: 11 miles (17.6 km) N of Roy Hill, *A.C. Beauglehole 11401*, 12 Aug. 1965 (SYD); Railway Crossing of Tom Price-Dampier railway and road from Wittenoom to Tom Price, *R.C. Carolin 7753*, 9 Aug. 1970 (SYD); c. 28 km NE of Mt. Newman, *A.C. Beauglehole 48957*, 19 Aug. 1974 (SYD).

Named from the prostrate habit. Latin, *prostratus* = prostrate.

G. muelleriana *Carolin*, **sp. nov.**

Herba ascendens vel erecta usque 40 cm caulibus pubescentibus simpliciter ac glandulose. Folia basalia elliptico-oblanceolata 3–6 cm longa, 8–20 mm lata dentata vel fere integra sparse pubescentia versus basim sensim contracta caespitis pilorum villosorum in axillis. Flores pedunculis sparse pubescentibus simpliciter ac glandulose articulatis ebracteolatis 20–35 mm longis in racemis terminalibus dispositi bracteis foliosis versus basim racemi sed minoribus et angustioris versus apicem. Pili glandulosi capitibus prominentibus brunneis multicellularibus. Corolla flava, signis brunneo-purpurescentibus in fauce 12–15 mm longa pubescens simpliciter ac glandulose extus et pubescens intus. Semina orbicularia 2.6–3 mm diametro ala sordida 1 mm lata.

HOLOTYPE: WESTERN AUSTRALIA: 40 miles (64 km) from Tom Price on Wittenoom road, *R.C. Carolin, 7761*, 9 Aug. 1970 (NSW). ISOTYPE: SYD.

Ascending to erect herb with a narrow tap-root and a short often branched stock. *Stems* terete or ridged, to 40 cm high, ± pubescent with scattered simple hairs and glandular hairs with multicellular heads. Basal leaves elliptic-oblanceolate, 3–6 cm long, 8–20 mm wide, tapering very gradually towards base into an indistinct petiole, dentate to almost entire, with scattered simple and glandular hairs and a tuft of villous axillary hairs; cauline leaves smaller narrower and less dentate. *Flowers* in a terminal raceme; bracts at base similar to leaves, becoming progressively smaller and more linear towards top; peduncles 20–35 mm long with scattered simple and glandular hairs, articulate just below ovary; bracteoles absent. *Sepals* narrow-lanceolate-oblong, c. 2 mm long, 0.2–0.3 mm long, acute, pubescent with simple and glandular hairs, adnate to ovary for ½–⅔ its length. *Corolla* yellow, 12–15 mm long, with brownish or purplish brown markings in throat, pubescent outside with glandular and simple hairs and pubescent inside below throat with hairs extending upwards along lines of connation, auriculate; anterior pocket distinct, ⅔ to equally as long as ovary; tube 2–3 mm long; superior lobes narrow-oblong-lanceolate, 8–9 mm long, 1.2–1.5 mm long; inferior lobes ovate-oblong, 3.5–4 mm long, c. 1.5 mm wide; wings to 3 mm wide, ½–⅔ as long as lobes; connate part of inferior lobes 5–6 mm long. *Stamen* filaments linear, 2–3 mm long; anthers narrow-oblong 1.5 mm long. *Ovary* pubescent with glandular and simple hairs; septum c. ⅔ as long as loculus; ovules 12–16; style 4–5 mm long with a very few villous hairs towards top; indusium transverse-ovate to

transverse-oblong, 1 mm long, c. 2.5 mm wide, brownish, villous hairs scattered over upper surface and a thin villous beard on lower surface, with a slightly curved orifice beset with white bristles to 0.5 mm long on upper lip and shorter ones on lower lip. *Fruit* simple- and glandular-pubescent, globular often slightly compressed, c. 6 mm diam., 2-valved to base and each valve remaining entire. *Seeds* flattened, dark grey, orbicular, 2.6–3 mm wide, colliculate with a prominent rim; wing 1 mm wide, thin dark, grey.

RANGE: Keartland, Fortescue and Canning Districts of Western Australia.

HABITAT: Shrub woodlands and *Triodia* grasslands.

DISCUSSION: This species was previously included under *G. forrestii* and is distinguished from it primarily by the much less dense indumentum.

SELECTED SPECIMENS (17): WESTERN AUSTRALIA: 56 miles (89.6 km) from Port Hedland on Broome road, *R.C. Carolin 7593*, 4 Aug. 1970 (SYD); 46 miles (73.6 km) from Marble Bar on Nullagine road, *R.C. Carolin 7688*, 6 Aug. 1970 (SYD); 96 miles (153.6 km) from Onslow on Mt Stuart road, *R.C. Carolin 7787*, 10 Aug. 1970 (SYD); 74 miles (118.4 km) from Tom Price on Yampire Gorge road, *R.C. Carolin 7771*, 9 Aug. 1970 (SYD).

Named for Ferdinand von Mueller who described so many *Goodenia* species and who, for many years in the last century, was Government Botanist in Victoria.

G. forrestii *F. Muell.*, Victorian Naturalist 9: 58 (1892) (as *G. foresti*).

LECTOTYPE: WESTERN AUSTRALIA: Part of the specimen 'Yule-Fortescue and Sherlock Rivers, *Hon. Sir John Forrest*' (MEL). ISOLECTOTYPE: ?K.

There are two elements amongst the specimens cited by Mueller under this species name: one is the present species and the other is *G. muelleriana* Carolin. Moreover, Mueller's type description is cast to cover both elements and it is quite impossible to choose which element corresponds more closely to it. Since one must be selected as the lectotype, I am choosing the part corresponding to the present species as being current usage (Int. Code of Botanical Nomenclature recommendation).

G. cusackiana (*F. Muell.*) *Carolin*, **comb. nov.**

BASIONYM: *Velleia cusackiana* F. Muell., Victorian Naturalist 12: 124 (1896). As in the case of *G. salmoniana*, Mueller was impressed here by the sepals being almost free from the ovary but this species has none of the other characteristics of *Velleia*. In particular the inflorescence is clearly that of a *Goodenia*.

G. sepalosa *F. Muell. ex Benth.*, Fl. Austral. 4: 72 (1869).

LECTOTYPE: WESTERN AUSTRALIA: Camden Harbour, *Martin* (K). ISOLECTOTYPE: possibly MEL 23753 but no collector named on label. PARALECTOTYPES: NW Coast, *Bynoe* (MEL); Port Essington, *Armstrong* (MEL). Of the three specimens cited by Bentham, the Armstrong collection from Port Essington belongs to a species in series *Calogyne*, the Bynoe collection has practically sessile leaves and the one from Camden Harbour is the only one bearing the name in Mueller's handwriting and corresponding to the protologue. This is therefore selected as the lectotype.

G. sepalosa var. **glandulosa** *Carolin*, **var. nov.**

Differt ab typo indumento glanduloso.

HOLOTYPE: WESTERN AUSTRALIA: 9 miles (14.4 km) S. of Derby, *N. Byrnes*, 24 May 1967 (NT 14200).

Differs from the type variety in that most of the hairs are glandular whilst in the type variety they are simple and coarse.

RANGE: Known only from the type collection.

HABITAT: *Acacia* woodlands.

The varietal epithet refers to the glandular indumentum. Latin, *glandulosus* = glandular.

G. arachnoidea *Carolin*, **sp. nov.**

Herba erecta vel ascendens. Folia basalia obovata 4–10 cm longa dentata obtusa petiolata pilis rigidis arcuatis instructa. Folia caulina ovata vel elliptica plus minusve similis foliis basalibus. Pedunculi ebracteolati pilis simplicibus retrorsis et arachnoideis confertis instructi. Corolla lutea 12–14 mm longa pilis arachnoideis simplicibusque extra. Capsula obovoidea 4–5 mm longa. Semina elliptica vel late elliptica 4 mm longa plana ochracea nitida.

HOLOTYPE: WESTERN AUSTRALIA: 8 km SW of Theda Stn., Kimberleys, *D. Symon 7101*, 29 May 1971 (AD). ISOTYPES: SYD, PERTH.

Erect to ascending herbs to 45 cm tall. *Stems* terete, pubescent with stiff retrorse simple hairs and arachnoid hairs. Basal leaves obovate, 4–10 cm long, 1.5–3.5 cm wide, tapering towards base into a distinct petiole, obtuse or with a tooth at apex, dentate, pubescent with stiff arcuate hairs on both surfaces; cauline leaves ovate to elliptic, smaller. *Flowers* in terminal and axillary racemes; bracts elliptic at base to linear near top of raceme, 1–2.5 cm long, 1–4 mm wide, sessile or tapering to a short petiole, acute, dentate, pubescent; peduncle to 4 cm long, always longer than bract, pubescent with retrorse simple hairs which are obscured by dense arachnoid hairs when young, articulate just below ovary. *Sepals* linear-deltoid, 2–5 mm long, 0.3–0.5 mm wide, entire, arachnoid-pubescent and with a few stiff simple hairs at apex, adnate to ovary for ¾ its length or more. *Corolla* yellow, 12–14 mm long, pubescent with arachnoid and stiff simple hairs outside, pubescent inside with short simple hairs becoming denser towards base and there forming a ± complete ring, auriculate; anterior pocket obscure, scarcely ¼ as long as ovary; tube 1–1.5 mm long; superior lobes narrow-oblong, 6–7 mm long, 0.7–0.8 mm wide; inferior lobes oblong, 4–5 mm long, 1.5 mm wide; wings to 1.5 mm wide, almost as long as lobe. *Stamen* filaments linear, 2–2.5 mm long; anthers oblong, 1 mm long. *Ovary* arachnoid and simple pubescent; septum very short; ovules 5–6; style 4–4.5 mm long, glabrous or with very few simple hairs; indusium broad-ovate, 1 mm long, 1 mm wide, brownish, glabrous on upper surface, with a few long stiff white hairs on lower surface, with an almost straight orifice beset with white bristles c. 0.1 mm long on both lips. *Fruit* obovoid, 4–5 mm long, 0.3 mm wide, pubescent, 2-valved almost to base. *Seed* biconvex, brownish yellow, elliptic to broad-elliptic, 4 mm long, 2–2.5 mm wide, glossy, obscurely verrucate and thus the reticulate pattern showing more clearly; wing c. 0.1 mm wide.

RANGE: Gardner (Kimberley) District of Western Australia.

HABITAT: Woodland, mostly on sandstone.

DISCUSSION: A distinct species rather difficult to place but apparently close to the *G. sepalosa* group of species; the arachnoid indumentum distinguishes it.

SPECIMENS EXAMINED (7): WESTERN AUSTRALIA: Base of Anjo Peninsula, east of Vansittart Bay, *E.A. Chesterfield 303*, 22 May 1984 (SYD, MEL); 9 km SW of Amax Basecamp, Mitchell Plateau, *K.F. Kenneally 7137*, 9 Feb. 1979 (SYD, PERTH); King Edward River, c. 50 km NE of Mitchell River HS., *E.G. Errey & A.C. Beauglehole 2853*, 25 Aug. 1978 (SYD); Longini Landing, Kalumburu Mission, *D.E. Symon 7112*, 30 June 1972 (AD, SYD)

The specific epithet refers to the appearance of the indumentum. Latin, *arachnoideus* = cobwebby.

G. brachypoda (*F. Muell. ex Benth.*) *Carolin*, **comb. et stat. nov.**

BASIONYM: *G. sepalosa* var. *brachypoda* F. Muell. ex Benth., Fl. Austral. 4: 72 (1869).

G. leiosperma *Carolin*, **sp. nov.**

Herba ascendens vel decumbens hispida pilis simplicibus grossis et glandulosis minutis. Caules usque 60 cm longi. Folia basalia ovata vel oblongo-elliptica usque anguste oblonga vel lanceolata 5–10 cm longa dentata sessilia saepe auriculata ad basim. Flores pedunculis 4–10 cm longis ebracteolatis non articulatis in racemis foliosis terminalibus dispositi. Corolla flava 15–20 mm longa hispido-pubescens extus pubescens intus. Capsula globosa circa 8 mm diametro duabus valvis hiantibus dehiscens. Semina elliptica 2.5–3.5 mm longa laevia nitentia fulvo-straminea ora prominenti sed ala ad hilo restricta.

HOLOTYPE: NORTHERN TERRITORY: 39 miles (62.4 km) S of Darwin, *G. Chippendale*, 18 March 1961 (NT 7776).

Ascending to decumbent short-lived herb with thin tap-root, hispid with long usually patent or spreading coarse simple hairs. *Stems* several, branched near base, slightly compressed or ridged towards top, to 60 cm long. *Leaves* basal and cauline but basal rosette very ephemeral; lower leaves ovate or oblong-elliptic to narrow-oblong or lanceolate, 5–10 cm long, mostly 13–20 mm wide, sessile, often auriculate at base, dentate; upper leaves more distinctly auriculate and smaller; basal leaves usually tapering very gradually towards base. *Flowers* in terminal leafy racemes; bracts leaf-like but smaller; peduncles 4–10 cm long, pubescent-hispid with long spreading and shorter simple hairs and minute glandular ones visible with magnification, not articulate; bracteoles absent. *Sepals* linear to linear-lanceolate, 5–6.5 mm long, 0.5–0.8 mm wide, acute, ciliate, adnate to ovary for c. ⅔ its length. *Corolla* yellow, 15–20 mm long, pubescent with long simple hairs and minute glandular ones outside, pubescent inside especially in depression formed by anterior petal in upper part of connate part of inferior lobes, wrinkled or with enations in connate part of inferior lobes, auriculate; anterior pocket obscure, scarcely ½ as long as ovary; tube 4–6 mm long; superior lobes falcate-narrow-elliptic, 10–11 mm long, 2–2.3 mm wide; inferior lobes oblong to elliptic-ovate, 6–7.5 mm long, 2.3–2.8 mm wide, anterior lobe sometimes slightly larger than anterior-lateral ones; wings 2 mm wide, dentate; connate part of inferior lobes 8–10 mm long. *Stamen* filaments linear, 3.5–4 mm long; anthers oblong, 2 mm long. Ovary pubescent-hirsute; septum scarcely ⅓ as long as loculus; ovules 10–15; style 7.5–8.5 mm long, villous-pubescent towards top; indusium depressed-obovate, 2 mm long, 4.5 mm wide, convex with a straight orifice beset with white bristles c. 0.5 mm long on upper lip and much shorter ones on lower lip. *Fruit* globular, c. 8 mm diam., hirsute, 2-valved to base, gaping. *Seeds* flat, elliptic, 2.5–3.5 mm long, 1.8–2.2 mm wide, smooth, glossy, with prominent raised rim; wing absent except near hilum.

RANGE: Victoria River and Darwin–Gulf Districts of Northern Territory.

HABITAT: Sclerophyll forests and woodlands.

DISCUSSION: This species is distinguished from its closest relative, *G. hispida*, with which it has been confused in the past, by the smooth seeds, the dense pubescence on the anterior corolla-lobe where it fuses with the other inferior lobes and the shorter ovary and more globular fruit. One specimen which I

have referred here, *N. Byrnes NB666* (NT 14382) from Litchfield Station, has almost glabrous stems, glabrescent leaves and lacks the dense pubescence inside the corolla. When more collections are available for study this may prove to be distinct.

Selected Specimens (29): Northern Territory: 13 miles (20.8 km) S of Darwin, *G. Chippendale*, 25 May 1958 (NT 4452); Fogg Dam area, *G. Chippendale*, 18 May 1959 (NT 6207); 2.7 miles (4.3 km) W of Burrundie, *G. Chippendale*, 16 March 1961 (NT 7649); McMinns Lagoon, *M. Holtze*, 1896 (MEL 23820); 5 miles (8 km) SW of Grove Hill, *G. Chippendale*, 17 March 1961 (NT 7669).

The specific epithet refers to the smooth seed. Greek, *leios* = smooth, *sperma* = seed.

G. durackiana *Carolin*, **sp. nov.**

Herba erecta vel decumbens. Caules usque 50 cm longi porcati pilis dispersis grossis simplicibus saepe retrorsis. Folia caulina elliptica vel oblonga 3–6 cm longa dentata acuta pilis dispersis saepe glabrescentia auriculata ad basim sessilia. Flores in racemis terminalibus foliosis dispositi. Pedunculi 2–5 cm longi ebracteolati non articulati pilis simplicibus in pagina adaxiali versus apicem. Corolla flava circa 15 mm longa fere glabra extus. Capsula globosa 8–10 mm diametro duabus valvis integris hiantibus dehiscens. Semina orbicularia 3–3.5 mm diametro laevia impolita ora prominenti sed sine ala.

Holotype: Western Australia: Kimberley Research Station, *M. Lazarides 6743*, 6 March 1963 (PERTH). Isotype: CANB 123774.

Short-lived herb with a tap root and ephemeral basal leaf-rosette. *Stems* erect to decumbent, to 50 cm long, ridged, with scattered coarse often retrorse simple hairs. *Leaves* mostly cauline, elliptic to oblong, 3–6 cm long, 1–2.5 cm wide, ± auriculate at base with a distinct very short petiole or sessile, coarsely dentate, with scattered coarse simple hairs, often glabrescent. *Flowers* in terminal leafy racemes; peduncles 2–5 cm long with coarse simple hairs on adaxial surface near top, not articulate, diverging particularly in fruiting stage. *Sepals* narrow-elliptic, c. 7 mm long and 2 mm wide, acute, often dentate towards base, ciliate, with a few scattered coarse simple hairs towards margin, adnate to ovary for ⅔–¾ its length. *Corolla* yellow, c. 15 mm long, almost glabrous outside but sometimes with a few long simple hairs, pubescent inside particularly in throat, auriculate; anterior pocket almost obsolete; tube c. 5 mm long; superior lobes narrow-oblong-falcate c. 7 mm long and 1 mm wide; inferior lobes narrow-oblong, c. 5 mm long and 1.5 mm wide; wings to 1.5 mm wide, as long as inferior lobe, c. 2 mm long on superior lobes; connate part of inferior lobes c. 6 mm long. *Stamen* filaments linear, c. 2 mm long; anthers narrow-oblong, c. 1.5 mm long. Ovary hirsute; septum c. ⅓ as long as loculus; ovules 20–30; indusium depressed obovate, convex, 1 mm long, 4 mm wide, with some simple hairs, with a ± convex orifice beset with white bristles c. 1 mm long on both lips. *Fruit* globular, 8–10 mm diam., hirsute, 2-valved to base, each valve entire, gaping. *Seeds* flat, brown-yellow, orbicular, 3–3.5 mm wide, smooth but dull, with a fairly prominent rim; wing obsolete.

Range: Gardner (Kimberley) District of Western Australia.

Habitat: Grasslands on black cracking soils.

Discussion: This species differs from the other species grouped around *G. sepalosa* in having smooth, dull seeds. It is possibly closest to *G. byrnesii*, from which it differs in the smooth seeds, broader sepals and the hairs on the

peduncle almost restricted to the adaxial side. From *G. sepalosa* it differs in the coarser and less dense indumentum as well as the smooth seeds.

SPECIMEN EXAMINED: WESTERN AUSTRALIA: Ord River, *K.M. Durack*, 4 May 1945 (PERTH).

Named after the collector of one of the specimens cited here, who is the author of 'Kings in Grass Castles'.

G. byrnesii *Carolin*, **sp. nov.**

Herba decumbens vel prostrata. Folia basalia fugacia autem caulina ovato-oblonga vel anguste oblonga 2–6 cm longa prasina sessilia auriculata dentata pilis paucissimis simplicibus. Pedunculi ebracteolati pilis simplicibus paucis instructi. Sepala anguste oblongo-elliptica 5–6 mm longa. Corolla lutea 17–20 mm longa. Capsula subglobosa 4–5 mm in diametro per duas valvas hiantes ad basim dehiscentia. Semina fulva plana elliptica 4 mm longa verrucosa.

HOLOTYPE: NORTHERN TERRITORY: 15 miles (24 km) SW of Elliott, *N. Byrnes 1433*, 12 March 1969 (NSW). ISOTYPE: SYD.

Decumbent to prostrate herb with thin taproot. *Stems* ± ridged above but becoming terete below, to 30 cm long, sparsely pubescent-hirsute with coarse simple hairs. Basal leaves ephemeral, oblanceolate, 3–6 cm long, 6–10 mm long, pale green, tapering gradually towards base; cauline leaves ovate-oblong to narrow-oblong, mostly 4–6 cm long, 5–10 mm wide, sessile, ± auriculate at base, dentate, sparsely villous-pubescent with coarse simple hairs. *Flowers* in terminal leafy racemes; bracts progressively smaller towards top; peduncles 3–5 cm long, with some scattered villous simple hairs, indistinctly articulate 2–3 mm below the ovary; bracteoles absent. *Sepals* narrow-oblong to elliptic, 5–6 mm long, 0.8–1 mm wide with some scattered coarse simple hairs especially on margins, acute, adnate to ovary for c. ⅔ its length. *Corolla* yellow, 17–20 mm long, villous-pubescent outside with coarse simple hairs and some minute glandular ones, pubescent inside especially towards base, auriculate; anterior pocket almost obsolete; tube 3.5–4 mm long; superior lobes falcate-narrow-oblong, 9–10 mm long, 1 mm wide; inferior lobes ovate, 6–7 mm long, 2.5–2.8 mm wide; wings c. 1.5 mm wide, dentate, c. ½ as long as lobes; connate part of inferior lobes, 8–9 mm long. *Stamen* filaments linear, 3–4 mm long; anthers oblong, c. 1 mm long. *Ovary* villous-pubescent; septum scarcely ⅓ as long as loculus; ovules c. 10; style 6–7 mm long, pubescent towards base; indusium transverse-oblong to depressed-obovate, 2 mm long, 4 mm wide, slightly convex above, glabrous or nearly so above, pubescent below, with an almost straight orifice beset with white hairs 0.5 mm long on upper lip and much shorter ones on lower lip. *Fruit* sub-globular, 4–5 mm diam., villous-hirsute, 2-valved for ¾ its length, gaping, each valve entire. *Seeds* flat, greyish-yellow, elliptic, 4 mm long, 1.8 mm wide, verrucate and granulose, with a distinct rim; wing obsolete except close to hilum.

RANGE: Dampier and Gardner (Kimberley) Districts of Western Australia; Victoria River, Barkly Tablelands and Darwin–Gulf Districts of Northern Territory; Burke District of Queensland.

HABITAT: Blacksoil plains.

SELECTED SPECIMENS (20): WESTERN AUSTRALIA: Bloodwood Creek, Mt Anderson, *H.F. Broadbent 624*, 28 Jan. 1953 (PERTH). NORTHERN TERRITORY: Leila Lagoon, *R.C. Carolin 9294*, 17 May 1974 (SYD); 42 miles (67.2 km) W of Wave Hill Police Stn., *R.A. Perry 2278*, 27 June 1949 (NT 18734); Powells Creek, *M. Holtze 73*, 1894 (MEL 22222).

QUEENSLAND: Flinders River Lara Stn., *Kennedy* (MEL 23762); Saxby River Crossing on Wondoola Road, *R.C. Carolin 8807*, 22 April 1974 (SYD); 6 miles (9.6 km) S. of Magoura, *R.C. Carolin 8817*, 23 April 1974 (SYD); Gregory Downs Road, *R.C. Carolin 8872*, 26 April 1974 (SYD).

Named for the collector of the holotype, who was a botanist in the Darwin Herbarium and subsequently at the Queensland Herbarium.

G. campestris *Carolin*, **sp. nov.**

Herba ascendens vel decumbens. Folia basalia fugacia autem caulina ovata ad lanceolata 1–7 cm longa dentata pilis paucis grossis simplicibus in marginibus atque pagina inferiora. Pedunculi glabri vel pilis paucissimis simplicibus ebracteolati. Corolla lutea 7–8 mm longa pilis simplicibus antrorsis extra. Capsula globosa vel ovoidea 5 mm longa per duas valvas hiantes ad basim dehiscentia. Semina plana elliptica 3.5 mm longa verrucosa.

HOLOTYPE: NORTHERN TERRITORY: c. 35 miles (56 km) S of Timber Creek, *R.C. Carolin 6667*, 10 May 1968 (NSW). ISOTYPE: SYD.

Decumbent to ascending herb with thin taproot. *Stems* compressed or obscurely ridged above but becoming terete towards base, to 50 cm long, glabrous or nearly so. *Leaves* mostly cauline but with a few ephemeral basal leaves; basal leaves obovate-oblong 1–3 cm long, 4–10 mm wide, tapering very gradually towards base; cauline leaves ovate to lanceolate, 1–7 cm long, 5–10 mm wide, sessile, ± auriculate at base, dentate, with very few coarse simple hairs especially on margins and lower surface of mid-rib. *Flowers* in terminal racemes; bracts leaf-like, progressively smaller towards top; peduncles 4–7 cm long, glabrous or with few short closely appressed simple hairs, very obscurely articulate 1–2 mm below ovary; bracteoles absent. Sepals lanceolate to narrow-oblong, 1–2 mm long, 0.3–0.5 mm wide, with few coarse simple hairs particularly on margin, adnate to ovary for ¾ its length. *Corolla* yellow with purplish veins, 7–8 mm long, pubescent outside with antrorse simple and minute glandular hairs, pubescent inside towards base, wrinkled on connate part of inferior lobes, auriculate; anterior pocket scarcely ¼ as long as ovary; tube 2–2.5 mm long; superior lobes falcato-narrow-oblong, c. 4 mm long, 1–1.2 mm wide; inferior lobes ovate, 2 mm long, 1.2–1.5 mm wide; wings 1–2 mm wide, c. ½ as long as lobes; connate part of inferior lobes c. 4 mm long. Stamen filaments 1.5–1.8 mm long; anthers oblong, 1.2 mm long. *Ovary* pubescent with coarse simple hairs; septum scarcely ¼ as long as loculus; ovules 6–8; style 4 mm long, glabrous or nearly so; indusium transverse-oblong, 1 mm long, 2 mm wide, flat or slightly convex above, with few scattered hairs particularly on lower surface, with an almost straight orifice beset with long (0.2 mm) white bristles on upper lip and shorter ones on lower lip. *Fruit* globular-ovoid, 5 mm long, 3.5–4.5 mm wide, glabrescent 2-valved, entire, gaping. *Seeds* flat, yellowish, elliptic, 3.5 mm long, 1.5–1.8 mm wide, verrucate, granulose, with a prominent rim; wing almost obsolete.

RANGE: Gardner District (Kimberley) of Western Australia.

HABITAT: Grassy plains on black soils.

DISCUSSION: This species is similar to *G. hispida* but differs in its habitat, the much smaller corolla, the inferior lobes which are shorter than the connate part of the inferior lobes, and in the very short septum of the fruit with many fewer seeds.

Specimens Examined: Northern Territory: Skull Creek, *R.C. Carolin 6659*, 10 May 1968 (SYD); 5 miles (8 km) W of Victoria River Crossing, *N. Byrnes NB740*, 10 May 1968 (NT 14575, NSW 87995).

Named for the open grassy plains in which this species grows. Latin, *campestris* = pertaining to plains.

G. malvina *Carolin*, **sp. nov.**

Herba decumbens vel prostrata. Folia basalia fugacia autem caulina lanceolata ad lineari-lanceolata vel ovata 2.5–7 cm longa dentata vel laciniata sessilia plus minusve auriculata pilis grossis sparsis. Corolla malvina 12–14 mm longa pilis simplicibus ac glandulosis extra. Pedunculi glabri sine bracteolae. Semina plana elliptica 3.5 mm longa papillosa rugosa.

Holotype: Western Australia: Kununurra, *M. Lazarides 6780*, 7 March 1963 (CANB 123779).

Decumbent to prostrate herb with thin taproot. *Stems* ± compressed but becoming terete towards base, to 50 cm long, glabrous. *Leaves* mostly cauline but with an ephemeral group of basal leaves; basal leaves obovate to oblanceolate, c. 2 cm long, tapering very gradually towards base; cauline leaves, lanceolate to linear-lanceolate or occasionally ovate, 2.5–7 cm long, 5–13 mm wide, sessile, ± auriculate, acute, dentate to laciniate or narrowly pinnate-lobed, sparsely pubescent with coarse simple hairs and sometimes minute glandular ones. *Flowers* in terminal racemes; bracts leaf-like, progressively smaller towards top; peduncles 2–5 cm long, glabrous, ± articulate 1–2 mm below ovary; bractcoles absent. *Sepals* lanceolate to narrow-oblong, 3–4 mm long 0.6–0.8 mm wide, acute, with simple hairs especially along margins, sometimes with few minute glandular hairs, adnate to ovary for c. ¾ of its length. *Corolla* mauvish sometimes ± yellow towards top or pinkish, mostly 12–14 mm long, simple-pubescent outside with some minute glandular hairs, pubescent inside especially towards base, auriculate; anterior pocket almost obsolete; tube 2.5–3 cm long; superior lobes falcate-narrow-elliptic, 6.5–7.5 mm long, 1–1.2 mm wide; inferior lobes narrow-elliptic; wings to 1.5 mm wide, laciniate, c. ⅔ as long as lobes; connate part of inferior lobes 3–4 cm long. *Stamen* filaments linear, c. 2 mm long; anthers oblong, c. 1 mm long. *Ovary* hirsute-pubescent with coarse simple hairs; septum scarcely ¼ as long as loculus; ovules 8–10; style 6–7 mm long with few scattered long hairs; indusium transverse- oblong, 1 mm long, 3 mm wide, with some scattered simple hairs on both surfaces, convex above with an almost straight orifice beset with white bristles c. 0.5 mm long on upper lip and much shorter (0.1–0.2 mm) ones on lower lip. *Fruit* ± compressed, ovoid 5–6 mm long, 3–4 mm wide, glabrescent, 2-valved for c. ¾s of its length, gaping, each valve entire. *Seed* flat, yellowish, elliptic, c. 3.5 mm long, 1.8 mm wide, verrucate, granulose, with a prominent rim; wing almost obsolete.

Range: Gardner (Kimberley) District of Western Australia; Victoria River District of Northern Territory.

Habitat: Grasslands on black cracking clay soils.

Discussion: This species differs from *G. hispida*, which appears to be its nearest relative, in the corolla colour, the glabrous stems and peduncles, and the much less pubescent, usually more laciniate narrower leaves. The specimens from Arnhem Land show some very distinct differences from those collected further west, the corolla in particular is much smaller, the sepals shorter and the leaves are not decurrent.

Selected Specimens (8): Western Australia: Ord River, *E. Langfield*, 1948 (PERTH): Ord River, *K.M. Durack*, 4 May 1945 (PERTH). Northern Territory: 29.9 miles (47.8 km) E of Newry, *G. Chippendale*, 10 May 1959 (NT 6000); 16.9 miles (27 km) NE of Beetaloo HS., *G. Chippendale*, 10 April 1959 (NT 5470).

Named for the mauve colour of the corolla. Latin *malvina* = mauve.

G. hispida *R. Br.*, Prodr.: 577 (1810).

Lectotype: Northern Territory: Carpentaria, Point S, [i.e. Point Blane], *R. Brown*, 28 Jan. 1803 (BM). Isolectotype: K.*

G. chthonocephala *Carolin*, **sp. nov.**

Herba annua radicibus fibrosis. Flores sessiles in axillis foliorum basalium lineari-lanceolatorum atque sic in capitulo super terra dispositi. Sepala linearia. Corolla 1–1.5 mm longa exalata. Semina orbiculata verrucata c. 0.2 mm diametro.

Holotype: Northern Territory: Cox River Station, *P.K. Latz 7176*, 2 July 1977 (NT 574444).

Small annual with fibrous root system and condensed stems. *Leaves* all basal, linear-lanceolate, to 8 cm long, to 3 mm wide, tapering gradually towards base, entire, pubescent when young with simple hairs, glabrescent. *Flowers* sessile in leaf axils and thus arranged in a pubescent head at ground level; bracteoles absent. *Sepals* linear, c. 0.5 mm long, acute, pubescent, adnate to ovary nearly to its summit. *Corolla* reddish when dry, 1–1.5 mm long, pubescent, with long simple hairs outside, almost glabrous inside; anterior pocket almost obsolete; tube c. 0.5 mm long; lobes ± equal, triangular, 0.5–1.0 mm long, less than 0.5 mm wide, acute; wings obsolete. *Stamen* filaments c. 0.5 mm wide; anthers subglobular, c. 0.1 mm diam. *Ovary* densely pubescent with simple and multicellular hairs; septum almost as long as loculus; ovules 30–40; style c. 0.5 mm long, pubescent; indusium broad-elliptic, c. 0.2 mm wide, flat, with ± curved orifice beset with very short bristles. *Fruit* ellipsoid, 3 mm long, pubescent with simple and multicellular hairs, distinctly 10-veined, 2-valved, each valve entire and separating from base not through a distinct articulation but where the tissue is weak. *Seeds* flat, reddish brown with a paler border, orbicular, c. 0.2 mm diam., verrucate; wing scarcely differentiated.

Range: Known only from the type collection.

Habitat: Damp places.

Discussion: This species is closest to G. *subauriculata*, from which it differs in the smaller flowers which are grouped into a head at ground level.

The specific epithet refers to the tight groups of flowers at ground level. Greek, *chthonos* = earth, *cephale* = head.

G. armstrongiana *Vriese*, Natuurk. Verh. Holl. Maatsch. Wetensch. Haarlem ser. 2, 10: 138 (1854).

Holotype: Northern Territory: Raffles Bay, *Armstrong*, Aug. 1846 (K).* There are two sheets of Armstrong's collection from Port Essington but only one bears the full labelling given by de Vriese. Since he states 'Unicum specimen vidi in Hookeri' this specimen, which agrees with his description and figure, must be the holotype.

G. argillacea *Carolin*, **sp. nov.**

Herba caule principali erecto ac ramis decumbentibus ad 70 cm longis. Folia anguste oblonga ad linearia 2–4.5 cm longa dentata sessilia glabra. Flores

pedicellis gracilis ebracteolatis ad 2.5–4 cm longis in racemis disposita. Corolla 10–12 mm longa pubescens. Capsula obovoidea 3–3.5 mm longa per duas valvas ad basim dehiscens. Semina elliptica 3 mm longa laevigata impolita.

HOLOTYPE: NORTHERN TERRITORY: 8 miles (12.8 km) NE of Mainoru River crossing on Bulman Road, *R.C. Carolin 9403*, 23 May 1974 (NSW). ISOTYPE: SYD.

Herb with an erect main stem and weak decumbent branches to 70 cm long. *Leaves* narrow-oblong to linear, 2–4.5 cm long, 2.5–6 mm wide, sessile and sometimes slightly auriculate, obscurely dentate with blunt teeth, with slightly recurved margins, glabrous. *Flowers* in leafy racemes; bracts similar to lower leaves but usually narrower and often longer; pedicels 2.5–4 cm long, slender, glabrous, not articulate; bracteoles absent. *Sepals* lanceolate, 2.5 mm long, 0.5 mm wide, acute, glabrous but for some simple hairs terminating the marginal denticles, adnate to ovary for ¾ its length. *Corolla* brownish-yellow (becoming pale purple on drying), 10–12 mm long, pubescent outside with ± appressed simple hairs, with very few simple hairs inside, auriculate; anterior pocket obsolete; tube 3 mm long; superior lobes narrow-oblong, 4–5 mm long, 0.7–0.8 mm wide; inferior lobes oblong-ovate, 2.5 mm long, 0.8 mm wide; wings c. 1 mm wide. *Stamen* filaments linear, 1.5 mm long; anthers narrow-oblong, 1 mm long. *Ovary* with a few strigose hairs; septum scarcely ¼ as long as loculus; ovules 6–8; style pubescent especially towards base, c. 5 mm long; indusium depressed-obovate, 1 mm long, 2.5 mm wide, glabrous on upper surface, pubescent on lower surface, with a slightly concave orifice beset with white bristles c. 0.3 mm on upper lip and shorter ones on lower lip. *Fruit* obovoid, 3–3.5 mm long, 2–2.5 mm wide, 2-valved almost to base, each valve entire. *Seed* elliptic, 3 mm long, 2.5 mm wide, minutely reticulate-alveolate or smooth and dull to naked eye, with a prominent rim; wing obscure except near the funicle.

RANGE: Only known from the type collection.

HABITAT: *Melaleuca* scrub on calcareous clays.

The specific epithet refers to the heavy clays on which the type collection was growing. Latin, *argillaceus* = pertaining to clay.

G. potamica *Carolin*, **sp. nov.**

Herba decumbens vel adscendens ad 20 cm. Caules pilis simplicibus arcuatis obtecti. Folia basalia oblanceolata ad obovata 2–8 cm longa dentata pubescentia pilis simplicibus grossis. Flores in racemis herbaceis vel umbellis ac in pedunculis glandulosis 10–15 mm longa dispositi. Pili glandulosi capitibus nigris vel fuligineis. Sepala pilis glandulosis conferte obtecta. Corolla flava 11–15 mm longa. Semina plana elliptico-obovata 2–3 mm longa verrucata exalata.

HOLOTYPE: 24 m W Liverpool River crossing, *J. Must 1069*, 27 June 1972 (NT).

Decumbent to ascending herb to 20 cm. Stems to 40 cm, pubescent with arcuate simple hairs. *Basal leaves* in an ephemeral rosette, tapering gradually towards base into an indistinct petiole, obtuse, dentate to almost entire, with coarse simple hairs; cauline leaves smaller, often broader and quite sessile, sometimes with a large basal lobe on one side only. *Flowers* in leafy racemes or condensed into umbels or rarely axillary in the basal leaves; bracts similar to cauline leaves but smaller and narrower; peduncles 10–15 mm long, pubescent with black- or dark brown-capped glandular hairs and some simple hairs, ebracteolate, not articulate. *Sepals* oblong, 1–1.5 mm long, c. 0.5 mm wide,

pubescent as peduncles, acute, adnate to ovary almost to its summit. *Corolla* yellow with brownish throat, 11–15 mm long, glandular pubescent outside, simple pubescent in throat, auriculate; anterior pouch obsolete; superior lobes oblanceolate to narrow-oblong, 5–6 mm long, 1 mm wide; wings 1–1.5 mm wide; inferior lobes oblong, 2.5–3 mm long, 0.6–0.8 mm wide; connate part of inferior lobes 4–5 mm long. *Stamen* filaments linear, 3 mm long; anthers narrow-oblong, 3 mm long. *Ovary* glandular pubescent; septum very short; ovules 8–10; style 4–5 mm long, pubescent; indusium semi-orbicular, 4 mm diam., yellowish brown, with a straight orifice beset with white bristles c. 0.3 mm long. *Fruit* ellipsoid to globular, 3–5 mm long; valves 2, entire, gaping to the base. *Seeds* flat, elliptic-obovate, 2.5 mm long, verrucate, with a distinct rim; wing obsolete except close to funicle.

RANGE: Arnhem Land.

HABITAT: River flats possibly extending into the forests on sandy soils.

DISCUSSION: Shows a close resemblance to those species originally included in the genus *Calogyne* particularly to *C. holtzeana* but the unbranched style clearly distinguishes it.

SPECIMENS EXAMINED: NORTHERN TERRITORY: Liverpool River, *F. Duncan*, 1975 (SYD); 45 km upstream from the mouth of the Liverpool River, *F. Duncan 803*, 2 May 1975 (SYD).

The specific epithet refers to the river flats in which this species grows. Latinised Greek *potamicus* = pertaining to a river.

G. porphyrea (*Carolin*) *Carolin*, **comb. nov.**

BASIONYM: *Calogyne porphyrea* Carolin, Brunonia 2: 4 (1979).

G. pilosa (*R. Br.*) *Carolin*, **comb. nov.**

BASIONYM: *Calogyne pilosa* R. Br., Prodr.: 579 (1810).

G. neglecta (*Carolin*) *Carolin*, **comb. nov.**

BASIONYM: *Calogyne neglecta* Carolin, Brunonia 2: 7 (1979).

G. heteroptera (*F. Muell.*) *Carolin*, **comb. nov.**

BASIONYM: *Calogyne heteroptera* F. Muell., Fragm. 10: 43 (1876).

G. holtzeana (*Specht*) *Carolin*, **comb. nov.**

BASIONYM: *Calogyne holtzeana* Specht, American-Australian Scientific Expedition to Arnhem Land 3: 309 (1958).

G. heppleana (*W. Fitzg.*) *Carolin*, **comb. nov.**

BASIONYM: *Calogyne heppleana* W. Fitzg., J. & Proc. Roy. Soc. Western Australia 3: 214 (1918).

G. symonii (*Carolin*) *Carolin*, **comb. nov.**

BASIONYM: *Calogyne symonii* Carolin, Brunonia 2: 12 (1979).

G. purpurea (*F. Muell.*) *Carolin*, **comb. nov.**

BASIONYM: *Calogyne purpurea* F. Muell., Fragm. 8: 57 (1873).

G. quadrifida (*Carolin*) *Carolin*, **comb. nov.**

BASIONYM: *Calogyne quadrifida* Carolin, Brunonia 2: 15 (1979).

G. kakadu *Carolin*, **sp. nov.**

Herba prostrata rosulifera stolonifera. Folia 6–15 mm longa anguste oblongo-elliptica ad oblanceolata glabrescentia plerumque acuta attenuata ad basim. Flores solitares in axillis foliorum. Sepala inaequalia. Corolla porphyrea 3 mm longa lobis aequalis. Ovarium obconicum.

HOLOTYPE: NORTHERN TERRITORY: Kakadu National Park, Site 80, *L.A. Craven 6176*, 30 May 1980 (CANB 309160). ISOTYPE: SYD.

Protrate herb with rosettes of leaves and stolons to 18 cm long. *Leaves* thick, narrow-oblong, c. 3 mm wide, tapering very gradually towards base, mostly acute, pubescent with soft fine simple hairs when young but glabrescent when mature, with a tuft of silvery axillary hairs. *Flowers* solitary in leaf axils; bracteoles absent; peduncles to 12 mm long, pubescent. *Sepals* narrow-deltoid to ovate, pubescent; anterior sepal c. 1.5 mm long, the others c. 0.5 mm long. *Corolla* red, to 2 mm long, pubescent outside with simple hairs; lobes equal, ovate, c. 1 mm long, darker towards base; wings and auricles absent. *Stamen* filaments linear, c. 1 mm long; anthers narrow-oblong, c. 0.5 mm long. *Ovary* obconic, acute towards base, 2–3 mm long; septum very short, extended into a free-central placenta bearing about 30 ovules irregularly arranged; style c. 1 mm long, glabrous; indusium globular with a few very short bristles on lips. *Seeds* not seen.

RANGE: Known only from the type collection.

HABITAT: Damp places in sandy-organic soil.

DISCUSSION: This is a species with a superficial resemblance to *G. pumilio* but in *G. kakadu* the leaves taper gradually towards the base, the hairs are simple and not stellate and the ovary is attenuate at the base.

The species is named for its locality and the epithet is an undeclinable Aboriginal word.

Excluded names

G. glandulifera Vriese, Natuurk. Verh. Holl. Maatsch. Wetensch. Haarlem ser. 2, 10: 129 (1854). = **Diaspasis filifolia** *R. Br.*

LECTOTYPE: In solo turfoso inter frutices prope urbiculam Albany, 4 Oct. 1840, *L. Preiss 2032* (LD 0447). ISOLECTOTYPE: L903,311-. . . .297. De Vriese thought that *Preiss 2032* was a mixed collection. He referred part to *G. armeriaefolia* DC. and part to *G. glandulifera* Vriese. This collection appears to be homogeneous. It is not possible to determine which part he refers to which species.

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Register of type specimens of mosses in Australian herbaria
General introduction and Part I. Special collections at NSW: Lord Howe Island, Vanuatu (New Hebrides)

Helen P. Ramsay, Julie Seur, Peter G. Wilson and Tracey Goodwin

Abstract

Ramsay, Helen P.[1], Julie Seur[2], Peter G. Wilson[2] and Tracey Goodwin[1] ([1]School of Biological Science, University of New South Wales, Kensington 2033 NSW Australia; [2]National Herbarium of New South Wales, Royal Botanic Gardens, Sydney 2000 NSW Australia) 1990. Register of type specimens of mosses in Australian herbaria. General introduction and part I. Special collections at NSW: Lord Howe Island, Vanuatu (New Hebrides). Telopea 3(4): 571–592. This is the first of a series of papers forming a register of type specimens in Australian herbaria. Here we deal with Lord Howe Island and Vanuatu (New Hebrides) mosses named by Brotherus & Watts (1915a, b). The register is a specimen-based approach detailing the basionym, reference, label data for each type specimen held, if more than one, the category of type and where possible the location of the holotype or lectotype if known. Included is data from recent studies, revised names or notes on action required such as lectotypification if this has not been done.

General introduction

The need for access to type specimens by monographers is well understood but the difficulties in locating such specimens can often make the work very time-consuming. Koponen (1982) outlined methods for recording the data required for a TYPE specimen register as used at the Botanical Museum, University of Helsinki (H). S. W. Greene (1984) put forward a proposal for a new approach to the production of type registers not on a **specimen-based** but on a **literature-based** approach. The **specimen-based** approach locates 'putative types' in the herbarium followed by a literature search to confirm the status of each specimen. Even when the specimen is found to agree with the details, the location of duplicates may not be known hence the status as holotype, isotype etc. may not be clear or easy to determine.

Early bryologists rarely designated a holotype, often naming many syntypes, making later lectotypification necessary. This latter requirement in modern taxonomy poses problems when recording 'types' from many unrelated species, as the total literature for all will not be known. Monographers are helping to improve the situation in recent revisions, e.g. Koponen (1979), Iwatsuki and Crosby (1979), Lewinsky (1984), Vitt and Ramsay (1985).

Some examples of published registers or catalogues for bryophytes are those of Hattori and Noguchi (1960), Clarke (1973), Shetler et al. (1973), Walther & Martiensen (1975), Grolle (1976), Pocs (1977), Ireland & Ley (1984).

Early botanists in Australia always sent specimens for identification to Europe where taxonomists were active and the unusual flora attracted great attention. As Australia was a colony of Britain, plant specimens were largely deposited at Kew or the British Museum. Whilst representative collections were sometimes

retained in Australia the type descriptions were usually based on specimens sent to the European specialists and the holotype retained there. In many cases duplicates were not retained in Australia. Early descriptions of Australian bryophytes were made by Carl Müller, Brotherus, Mitten, Dixon, and the holotypes were retained in their herbaria now located at Helsinki (Brotherus), New York (Mitten), British Museum (Dixon) while the Carl Müller herbarium was largely destroyed in Berlin in 1943.

The proposal of S.W. Greene (1984) to produce a literature-based catalogue for these latter types would enable the isotypes and syntypes in herbaria throughout the world to be sought. W.W. Watts, who made extensive collections in Australia (New South Wales, N. Queensland, Victoria and Lord Howe Island), sent his collections to Brotherus for identification. Brotherus and Brotherus & Watts published lists and descriptions of new species [in the majority of cases Brotherus wrote the description, but Watts did sometimes provide him with an outline] based on material at H-BR, and these would therefore be the types (see Ramsay 1980). In most cases a series of specimens, collected at different times and from different localities (syntypes), were listed with the description and no holotype designated. Although the National Herbarium of New South Wales contains the bulk of Watts' collections most are duplicates of the various types and syntypes held at H-BR. Consequently, there are very few holotypes present in NSW, and most of the syntypes are isosyntypes.

The type method as understood today was not practised widely in bryology until recently (Koponen 1982). Bryology in Australia is in the early stages of revival (since the 1970s) as cryptogams were generally sadly neglected in the main herbaria until fairly recently (Ramsay & Seur in press). Within the last ten years the situation has greatly improved and bryophytes are now being actively curated in all major Australian herbaria. There are, as yet, only two people appointed with research interests in bryophytes in charge of these collections in Australian herbaria: Streimann (CBG), and Bell (AD), curation being an organisational rather than a research activity. In spite of this, the collections are now much more accessible for loan and study by monographers.

The following study was undertaken to determine what collections of moss-types were held here in Australia. Exchange between early Australian and overseas workers resulted in a number of isotypes or syntypes for exotic species being deposited here in Australian herbaria, particularly at NSW and MEL. Types for both Australian and exotic specimens lodged in Australian Herbaria (exotics only in NSW) are being studied and the results will appear as a series of publications.

Data collection

The register has been compiled from those specimens located in Australian herbaria which were annotated as type or sp. nov. i.e. 'putative types'. Recent revisions and descriptions of new species have enabled typification for some specimens to be clearly stated. A survey of literature based on data from Index Muscorum (Wijk, Margadant and Florschütz 1959–1969) and supplements (Crosby 1977, 1979; Crosby and Bauer 1981, 1983, 1987; Bauer and Crosby 1986) has enabled others to be classified. The register lists the original name given (basionym) and is arranged alphabetically with cross-referencing for name changes. The work, begun in 1973 as an extension of studies for a Census of New South Wales Mosses (Ramsay 1984), follows closely the format used by

Clarke (1973), (i.e. details on the original packet such as name, dates and locality, collector, herbarium number) and remarks added later. In addition, the present status of the specimen, by reference to literature and to collections in major overseas herbaria, is given when known or suggested when not. Many names have been absorbed into synonymy by later revisions and the most recent references are included together with the original one. In addition, latitudes and longitudes have been included for the localities, to assist overseas workers.

Specimens from the following herbaria have been studied: AD, BRI, CANB, CBG, HO, MEL, MELU, NSW, PERTH, SYD, and the private herbaria of I. G. Stone and D. G. Catcheside whose type specimens will be or have been deposited in MEL, MELU (Stone) and AD (Catcheside). A survey of literature relevant to the specimens in Australia has identified the great dearth of types for Australian species in Australian herbaria.

The data were entered and collated using dBaseIII program and the following format for continued access and analysis.

Type Specimens Register

1. Original name attached to the specimen [BASIONYM]
2. Reference to original description [REF]
3. Specimen Label Data [LABEL]
4. Specimen(s) cited in Protologue [PROTO]
5. Herbaria holding types
   A. Australian [AUSTR]
   B. Non-Australian [NON]
6. Present name, reference to recent treatment [REC]

Entry of data

BASIONYM:The names are arranged alphabetically according to genus and species.

REF: Journal reference to protologue is given. A complete list of references appears at the end of the Register.

LABEL: Label data are given for each specimen located with this name. Where two specimens have identical data this is noted at the end of the data entry. Where labels differ, even in minor ways, each is entered separately. Each entry is numbered sequentially 1, 2, 3 where multiple entries occur.

PROTO: Specimen citations from the protologue are given in inverted commas exactly as in the original publication with misspellings etc. If there are no locality details in the protologue but they appear elsewhere in the text they are included in square brackets. If misspelling of a locality is confusing or incomplete, clarification is given in square brackets.

AUSTR: The herbarium in Australia holding type specimens is given. The status of the type is indicated when known. Collector's numbers are listed for each herbarium holding specimens.

NON: Where holotypes or syntypes from which the protologue was derived were most likely to be held in overseas herbaria, the information was sent to the relevant herbarium (e.g. Brotherus names to H-BR) for confirmation.

REC: Where a new name has been published for the taxon, the new name is listed and the original one is recorded as a synonym. The presently accepted name or new combination is listed together with the reference. If the combination is a later homonym, the earlier name is given and the reference cited if it refers to a non-Australian collection. Where based on an Australian collection, the details will be found alphabetically in the Register. Where lectotypification is required this is stated. Other relevant information not included elsewhere such as latitude and longitude of the type locality, is recorded here.

The location of some types, thought to be in Australia, cannot be determined, e.g. Vitt and Ramsay (1985) have been unable to locate types for some *Macromitrium* species all thought to be at MEL. The Register has not included names *in schedis*, but *nomina nuda* are appended, for clarification only, as a separate list.

Presentation of data

The register has been prepared in the hope that it will be of value to workers wishing to trace types. If there are any errors or misinterpretations it would help if the senior author could be notified quickly to enable rapid circulation of the corrections.

The senior author accepts responsibility for all errors and misjudgments. Entry of the manuscript into the computer (thanks to Tracey Goodwin, Julie Seur) will enable lists to be circulated to individual herbaria in return for their assistance.

The work will appear in several parts as listed below, compiled by the senior author with assistance from others.

Register of Type Specimens held in Australian Herbaria

- Part I. Special collections at NSW: Lord Howe Island, Vanuatu (New Hebrides).
- Part II & III. Australian mosses.
- Part IV. Specimens at NSW determined as *sp. nov.* by Carl Müller.
- Part V & VI. Exotic mosses at NSW: (to be arranged and published in geographical regions: New Zealand, Papua New Guinea, Asia, Pacific Islands, Europe, Africa, America N & S.)

A separate publication 'Hepatic types in the National Herbarium of New South Wales (NSW) and the Ray Herbarium, Sydney (SYD)' is being prepared.

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Part I. Special collections at NSW: Lord Howe Island and Vanuatu (New Hebrides)

The collections listed in this section are based primarily on specimens cited in publications by Brotherus & Watts (1915a, 1915b) and held at NSW. All the Lord Howe specimens were collected by W.W. Watts in 1911 whereas those from Vanuatu (formerly New Hebrides) were not collected by Watts but sent to him, mainly by Dr W. Gunn, whilst he was Curator of Bryophytes at the National Herbarium of New South Wales (Ramsay 1980). The specimens were incorporated into his herbarium and given a number by him.

The numbering system used by W.W. Watts needs to be understood by those referring to his specimens. Each geographical area, (e.g. Lord Howe Island, New Hebrides, New South Wales) where he collected or from which he obtained specimens, was given its own set of numbers. Thus numbers related to Lord Howe Island specimens should be recognised as LHI 530 whereas those from North Queensland would be NQ 530, New Hebrides (Vanuatu) NH 530 and so on. Specimens from other collections were also given numbers by him. Understanding his system will prevent confusion when the same number appears on different specimens. Watts sent specimens from his collections to many overseas herbaria on exchange. Those related to his publications with Brotherus went to Helsinki (H-BR) and duplicates were retained at NSW while some duplicates were sent also to other herbaria. As holotypes were not designated in their publications and the herbarium holding not cited, it has been assumed here that the specimen examined by Brotherus and held in H-BR will be the holotype if a single specimen is cited. Where a series of syntypes were cited and no lectotype has been chosen this has been noted. Thus in most cases the collections at H-BR take priority over those at NSW, but where there is any doubt, as Watts examined all specimens, the specimen at NSW has been named as lectotype.

Register of Type Specimens at NSW: Lord Howe Island

(The latitude and longitude for Lord Howe Island as represented by Mt Gower is 31°36′S 159°05′E ; for convenience Lord Howe Island is abbreviated as LHI in label data in this study)

Bryum aequicollum *Broth. & Watts* (1915a: 372)

LABEL:
1. Second open gully, S. of King's, LHI, *W.W. Watts 213a,* 15.vii.1911.
2. Mt Gower, LHI, *W.W. Watts 360,* 1–4.viii.1911
3. Open gully just S of King's, LHI, *W.W. Watts 147d,*
4. Rocks S. of King's, LHI, *W.W. Watts 207,* 15.vii.1911.
5. Mt Gower, LHI, *W.W. Watts 408,* 1–4.viii.1911.

PROTO: 'Among rocks one mile south of King's (n 207); open gully south of King's (n 147d, 213a); Mt Gower (n 360, 408); also Northern Hills and sea cliff, Middle Beach.'

ISOSYNTYPE: NSW (*Watts 147d, 207, 213a, 360, 408*)

SYNTYPE: H-BR (*Watts 147d, 207, 213a, 360, 408*)

REC: [= *B. dichotomum* Hedw., based on specimens cited by Ochi (1970: 17): *Watts 147d, 213a, 360* from H. Not lectotypified by Ochi.]

Bryum diversinerve *Broth. & Watts* (1915a: 371)

LABEL:
1. Sea cliffs, Middle Beach (to south), LHI, *W.W. Watts 105,* 7.vii.1911.
2. Second open gully S. of King's, LHI, *W.W. Watts 190,* 15.vii.1911.
3. Northern Hills, LHI, *W.W. Watts 283*, vii.1911.

PROTO: 'Sea cliff, Middle Beach (n 105); Northern Hills (n 283); gully, south of King's (n 190).'

SYNTYPE: NSW (*Watts 190*); ISOSYNTYPE: NSW (*Watts 105, 283*)

SYNTYPE: H-BR (*Watts 105, 283*)

REC: [=*B. erythrocarpoides* C. Muell.: specimens cited by Ochi are *Watts 283, 105* and *Watts 332* as *B. howeanum* from H; not lectotypified by Ochi (1970: 29). Annotated = *B. erythrocarpoides* C. Muell., T. Seki 1975 on H-BR collections]

Bryum howeanum *Broth. & Watts* (1915a: 373).

LABEL:
1. North Head, LHI, *W.W. Watts 500*, viii.1911.
2. North Head, LHI, *W.W. Watts 503*, viii.1911.
3. North Head, LHI, *W.W. Watts 501=500* viii.1911. (second specimen 501 not annotated=500).
4. North Head, LHI, *W.W. Watts 510*

PROTO: 'North Head. (n 500, 501, 503, 510).'

ISOSYNTYPE: NSW (*Watts 500, 501, 503, 510*)

SYNTYPE: H-BR (*Watts 500, 501, 503, 510*)

REC: [= *B. campylothecium* Tayl.: specimens cited by Ochi (1970: 51) are *Watts 485, 500, 500a, 510, 522,* all from H; not lectotypified by Ochi.]

Bryum leptothecioides *Broth. & Watts* (1915a: 374)

LABEL:
1. S. of Robins', LHI, *W.W. Watts 100*, 6.vii.1911
2. North Head, LHI, *W.W. Watts 491*, viii.1911

3. North Head, LHI, *W.W. Watts 494*, viii.1911 (2 specimens).
4. North Head, LHI, *W.W. Watts 506?a*, viii.1911.
5. Northern Hills, LHI, *W.W. Watts 284a* , vii.1911.
6. Northern Hills, LHI, *W.W. Watts 235a*, 21.vii.1911.
7. Blenkenthorpe's Beach, LHI, *W.W. Watts 489*, viii.1911. Syntype.
8. Gully S. of King's, LHI, *W.W. Watts 180*, 15.vii.1911. Syntype.
9. Open gully just S of King's, LHI, *W.W. Watts 176*, 13.vii.1911 or 15.vii.1911
10. Open gully just S. of King's (Mt. Lidgbird), LHI, *W.W. Watts 162*, 13.viii.1911. Syntype.
11. Open gully above King's, LHI, *W.W. Watts 151*, 13.vii.1911.
12. Rocks and soil beyond G. Wilson's, LHI, *W.W.Watts 66*, 5.vii.1911 Syntype.

PROTO: 'Rock by sliprails south of Robin's farm (n 100); gully south of King's, base of Mt. Lidgbird (n 151, 152, 162, 176, 180); Blenkinthorp's Beach (n 489, 526); Northern Hills (n 235a, 284a); rock & soil back of Gower Wilson's (n 66); North Head (n 491, 494, 506a).'

SYNTYPE: NSW (*Watts 151*); ISOSYNTYPE: NSW (*Watts 66, 100, 162, 176, 180, 235a, 284a, 491, 494, 506?a*).

SYNTYPE: H-BR (*Watts 66, 100, 162, 176, 180, 235a, 284a, 489, 491, 494, 506a*)

REC: [=*B. capillare* L. ex Hedw., no specimens mentioned by Ochi (1970: 48). Not lectotypified by Ochi]

Bryum limbifolium *Broth. & Watts* (1915a: 373)

LABEL:
1. In drip of fall, Head of 'Dinner Run', LHI. *W.W. Watts 332*, 29.vii.1911 Type

PROTO: 'Growing in drip of a waterfall at the head of the 'Dinner Run' on the eastern side of Mt. Lidgbird' [No number given].

ISOTYPE: NSW

HOLOTYPE: H-BR

REC: [= *B. erythrocarpoides* Ochi (1970: 17). Note on specimen in H-BR 'No.332 determined as *B. howeanum* Broth. & Watts n. sp. rev. Ochi 14.1.1968 = *B. curvicollum* Broth'. The specimen at NSW was not so annotated but called *B. limbifolium* by Watts and needs checking against the H-BR specimen]

Bryum philonotideum *Broth. & Watts* (1915a: 372)

LABEL:
1. Blenkinthorp's Beach, LHI, *W.W. Watts* viii.1911.
2. Rocks, Blenkinthorp's Beach, LHI, *W.W. Watts 526* viii.1911.

PROTO: 'Rocks, Blenkinthorp's Beach (n 526)'

ISOTYPE: NSW; PARA: NSW (Watts no number)

HOLOTYPE: H-BR

REC: [= *B. dichotomum* Hedw.; Ochi (1970: 17) cites specimen in H as Type. Specimen 1 above is missing the number 526 but is otherwise identical and is therefore determined here as a paratype]

Ectropothecium howeanum *Broth. & Watts* (1915a: 379–380)

LABEL:
1. Gully, back of 'The Pines', LHI, *W.W. Watts 530*
2. 'The Pines', LHI, *W.W. Watts 533*
3. Gully, back of 'The Pines', LHI, *W.W. Watts 533* 19.vii.1911.

PROTO: 'on rocks in deep gully at back of 'The Pines' July 1911 (n 530, 533)'

ISOSYNTYPE: NSW (*Watts 530, 533*)

SYNTYPE: H-BR (*Watts 530, 533*)

REC: [Although all specimens do not have full label data the locality and numbers are correct. Not yet lectotypified]

Echinodium parvulum *Broth. & Watts* (1915a: 376)

LABEL:
1. 'Run' above 'Scaly Bark' LHI, *W.W. Watts 517* viii.1911

PROTO: "In 'Run' above 'Scaly Bark', Mt. Lidgbird (n 517)."

ISOTYPE: NSW

HOLOTYPE: H-BR

REC: [= *E. umbrosum* (Mitt.) Jaeg. var. *umbrosum* Churchill, (1986: 128); specimen in H-BR annotated as Holotype on packet by G. Scott 11.5.1976]

Fissidens amblyothallioides *Broth. & Watts* (1915a: 366)

LABEL:
1. Gully S. of King's, LHI, *W.W. Watts 153* 13.vii.1911
2. Open paddock beyond G. Wilson's, LHI, *W.W. Watts 78* 5.vii.1911
3. Edge of sideling on way to King's, LHI, *W.W. Watts 102* 6.vii.1911
4. Gully beyond King's, LHI, *W.W. Watts 145* 13.vii.1911
5. Open gully S. of King's, LHI, *W.W. Watts 157* 13.vii.1911
6. Open gully just S. of King's, LHI, *W.W. Watts 163 =157* 13.vii.1911
7. Open gully beyond King's, LHI, *W.W. Watts 178 =157* 15.vii.1911
8. Dinner 'Run', LHI, *W.W. Watts 327* 29.vii. 1911
9. North Head, LHI, *W.W. Watts 494* viii.1911

PROTO: 'Gully, south of King's (n 153, 157, 178, 145, 163); North Head (n 494 ex p.); edge of sideling on way to King's (n 102); paddock. at north end of Island (n 78); Dinner 'Run' (n 327).'

ISOSYNTYPE: NSW (*Watts 78, 102, 145, 153, 157, 163, 178, 327, 494*)

SYNTYPE: H-BR (*Watts 78, 102, 145, 153, 157, 163, 178, 327, 494*)

REC: [Data for *Watts 78* in NSW differs from protologue in mention of G. Wilson's but specimen is annotated type. A lectotype needs to be chosen]

Fissidens arcuatulus *Broth. & Watts* (1915a: 368)

LABEL:
1. Ground on way to Johnson's from Robin's, LHI, *W.W. Watts 118* 8.vii.1911

PROTO: 'On ground beyond Robin's farm (n 118)'

ISOTYPE: NSW

HOLOTYPE: H-BR

REC: [no additional information]

Fissidens longiligulatus *Broth. & Watts* (1915a: 367)

LABEL:
1. Mt Gower, LHI, *W. W. Watts 382* 1–4.viii.1911 [mixed with *Echinodium hispidum*] sent to Brotherus as possibly *sp. nov.*

PROTO: 'On trees, Mt Gower n. 382, 525.'

ISOSYNTYPE: NSW (*Watts 382*)

SYNTYPE: H-BR (*Watts 382, 525*) [annotated by I.G. Stone (1988) in pencil = *F. asplenioides*, but the combination is not yet published]

Fissidens subtenellus *Broth. & Watts* (1915a: 366)

LABEL:
1. By well at back of G. Wilson's, LHI, *W.W. Watts* 60 (=56) 4.vii.1911 det. Broth.
2. Track above sugar cane, back of Paton's, LHI, 1 *W.W. Watts* 56 4.vii.1911 det. Broth.

PROTO: 'Track above sugarcane back of Paton's (n. 56); back of Gower Wilson's (n. 60 ex p.).'

ISOSYNTYPE: NSW (*Watts 56, 60*)

SYNTYPE: H-BR (*Watts 56, 60*)

REC: [Lectotype needs to be chosen]

Fissidens tenelliformis *Broth. & Watts* (1915a: 367)

LABEL:
1. Northern Hills, LHI, *W.W. Watts 221* 21.vii.1911 det. Broth.
2. Northern Hills, LHI, *W.W. Watts 223* 21.vii.1911
3. Northern Hills, near top, *W.W. Watts 209* 20.vii.1911

PROTO: 'On earth, Northern Hills (n. 209, 221, 223).'

ISOSYNTYPE: NSW *(Watts 209, 221, 223*)

SYNTYPE: H-BR (*Watts 209, 221, 223)*

REC: [Lectotype needs to be chosen]

Fissidens wattsii *Broth.* (1915a: 368)

LABEL:
1. Northern Hills, I, *W.W. Watts 224* 21.vii.1911 det. Broth. 1913
2. Stone, Intermediate Hill, LHI *W.W. Watts 136 (=515)* 10.vii.1911 det. Broth. 1913
3. Run, scaly bark, LHI, *W.W. Watts 518*.viii.1911 det. Broth. 1913
4. Run, scaly bark, LHI, *W.W. Watts 515*.viii.1911 det. Broth. 1913
5. Dinner Run, LHI, *W.W. Watts 337 (=209)* 29.vii.1911 det. Broth. 1913

PROTO: 'Northern Hill (n. 224); Dinner Run (n.337); 'Run', Scaly Bark (n.515, 518); Stone, Intermediate Hill (n. 136).'

ISOSYNTYPE: NSW (*Watts 136, 224, 337, 515, 518*)

SYNTYPE: H-BR (*Watts 136, 224, 337, 515, 518*)

REC: [Lectotype needs to be chosen]

Holomitrium perichaetiale *(Hook.) Brid. var.* **robustum** Broth. & Watts (1915a: 364–5)

LABEL:
1. Saddle Back, LHI, *W.W. Watts 449* 5.vii.1911

PROTO: 'Saddle Back (no. 449)'

HOLOTYPE: NSW
? : H-BR (no specimen located)

REC: [see comments in Ramsay, (1986: 311)]

Isopterygium howeanum *Broth. & Watts* (1915a: 380–1)

LABEL:
1. Hillside back of Johnson's, LHI, *W.W. Watts 112* 8.vii.1911

PROTO: 'on rotten log, back of Johnson's (n 112)'

HOLOTYPE: NSW

ISOTYPE: H-BR

REC: [no additional information]

Macromitrium peraristatum *Broth.* (1893: 45)

LABEL:
1. Mt Gower LHI, *T. Whitelegge* ix.1887 Type [Hb. NSW MI2734]
2. LHI, *T. Whitelegge 2* viii.1887
3. On branches of trees, Mt Gower, LHI, viii-ix 1887 *T.Whitelegge 2B* (2 specimens)[in Whitelegge's handwriting]
4. LHI *T. Whitelegge* Sept 1887 [Watts' handwriting, thus data transferred from original when duplicate made]

PROTO: 'Lord Howe Island, Mt Gower, ubi ad ramulos arborum m. Sept. 1887. legit T. Whitelegge (n 2)'

ISOTYPE: NSW (*Whitelegge 2,* Sept 1887); PARATYPE: (*Whitelegge 2B*)

HOLOTYPE: H-BR (*Whitelegge 2*)

REC: [Name confirmed Vitt & Ramsay, (1985: 425). Whitelegge collected a series of specimens in August-September, 1887. According to the protologue *Whitelegge n2* was collected on Mt Gower in September, but the specimen held at NSW (n.2) gives only Lord Howe Island as the locality and the date as *August.* but is listed here as an isotype. The specimen annotated type at NSW is not numbered but fits the date and locality (=isotype) as does specimen 4 above. Only two specimens, *Whitelegge 2B*, are annotated as in the protologue, but the date on these is viii-ix 1887. These are named here as paratypes. The single specimen held at H-BR is the holotype.]

Macromitrium subbrevicaule *Broth. & Watts* (1915a: 371)

LABEL:
1. Rocks, cliff, North Head, LHI, *W.W. Watts 478* viii.1911
2. North Head, LHI, *W.W. Watts 507* viii.1911
3. Sea cliff, Northern Hills, LHI, *W.W. Watts 239* 21.vii.1911
4. North Head, LHI, *W.W. Watts 504* viii.1911
5. Seacliff, Top of Northern Hills, LHI, *W.W. Watts 236* 21.vii.1911
6. Seacliff, top of Northern Hills, LHI, *W.W. Watts* 21.vii.1911

PROTO: 'Growing mostly on cliffs at North Head and on the Northern Hills (n 236, 239, 478, 504, 507).'

ISOLECTOTYPE: NSW (*Watts 239*); SYNTYPE: NSW (*Watts 236, 478, 504, 507*); PARATYPE: NSW (Watts no number)

LECTOTYPE: H-BR (*Watts 239*) Vitt & Ramsay, 1985; SYNTYPE: H-BR (147d, 207, 360, 408)

REC: [= *M. brevicaule* (Besch.) Broth. Vitt & Ramsay, (1985: 381–2) Specimen 6 above without collection number is selected here as a paratype since data match protologue]

Rhaphidostegium subfalcatulum *Broth. & Watts* (1915a: 381–2)

LABEL:
1. Back of Henderson's, LHI, *W.W. Watts 131* 10.vii.1911
2. Intermediate Hill, LHI, *W.W. Watts 134* 10.vii.1911

3. Above Johnson's, LHI, *W.W. Watts 122* 8.vii.1911
4. Mt. Gower, LHI, *W.W. Watts 364a* viii.1911
5. Intermediate Hill, LHI, *W.W. Watts 135* 10.vii.1911
6. Mt. Gower, LHI, *W.W. Watts 370* 1–4.vii.1911 (2 specimens)
7. Mt. Gower, LHI, *W.W. Watts 400* viii.1911

PROTO: 'on rotten log, Intermediate Hill (n 134, 135); creek above Johnson's (n 122); gully at back of Henderson's (n 131); Mt. Gower (n 370, 400); top of Mt. Gower (n 364a).'

ISOSYNTYPE: NSW (122, 131, 134, 135, 364a, 370, 400)

SYNTYPE: H-BR (122, 131, 134, 135, 364a, 370, 400)

REC: [=? *Rhaphidorrhynchium subfalcatulum* (Broth. & Watts) Broth.- listed as *Pungentella subfalcatulum* (Broth. & Watts) C.Muell. in Ramsay (1984: 556). Lectotype not yet chosen]

Rhynchostegiella campylioides *Broth. & Watts* (1915a: 383)

LABEL:
1. Second open gully, south of King's, LHI, *W.W. Watts 201* 15.vii.1911

PROTO: 'swampy ground, open gully, south of King's (n 201)'

ISOTYPE: NSW

HOLOTYPE: H-BR

REC: [no additional information]

Rhynchostegium tenuifolium *(Hedwig) Reichardt. var.* **howeanum** Broth. & Watts (1915a: 383)

LABEL:
1. Back of G. Wilson's, LHI, *W.W. Watts 50* 4.vii.1911

PROTO: 'very plentiful at back of Gower Wilson's; also found in Robin's swamp.'

LECTOTYPE: NSW (*Watts 50*)

ISOLECTOTYPE: H-BR

REC: [No number was cited in the protologue. As the NSW specimen *Watts No. 50* has var. *howeanum* written on it but those in H-BR do not, the specimen at NSW has been chosen here as the lectotype]

Thuidium trachypodioides *Broth. & Watts* (1915a: 379)

LABEL:
1. 'The Pines' LHI, *W.W. Watts 293* 19.vii.1911
2. Gully, back of 'The Pines', LHI *W.W. Watts 287* (=438) 19.vii.1911 det. Broth. 1913. Lectotype (duplicate), Haak (1983).
3. Gully at back of 'The Pines' LHI, *W.W. Watts 537* 20.vii.1911 det. Broth. Syntypetype Haak (1983).
4. Gully, back of 'The Pines', LHI, *W.W. Watts 289* 19.vii.1911. det. Broth. Syntypetype, Haak (1983).

PROTO: 'On coral rocks, gully behind 'The Pines' (n 287, 289, 293, 537); south of King's, open gully (n 164) and creek (n 171) top of Mt. Gower (n 389)'

ISOLECTOTYPE: NSW (*Watts 287*); ISOSYNTYPE: NSW (*Watts 289, 293, 537*)

LECTOTYPE: H-BR (*Watts 287, Touw & Haak* (in press)); SYNTYPE: H-BR (*Watts 289, 293, 537*)

REC: [Wijk et al 1959–1969 cite this as *hom. illeg.* In recent studies Touw & Haak (in press) have checked specimens *Watts 164, 171, 389* and identified them as *T. sparsum.*

The lectotype chosen for *T. trachypodioides* as *Watts 287*. Only the collections from the gully behind 'The Pines' belong to this taxon. The species is known only from these type collections.]

Tortella subflavovirens *Broth. & Watts* (1915a: 369–370)

LABEL:
1. Ground above beach near Flagstaff, LHI, *W.W. Watts 300* 24.vii.1911
2. Rocks, beach near Wilson's, LHI, *W.W. Watts 84* 5.vii.1911
3. Middle beach, LHI, *W.W. Watts 106* 7.vii.1911
4. Rocks by sea, west side, near Johnson's, LHI, *W.W. Watts 108* 8.vii.1911
5. Sea cliff near landing place, LHI, *W.W. Watts 174* 14.vii.1911
6. LHI, ex. p. *W.W. Watts 502* (In literature, location is 'stone-border, Wilson's garden').
7. Blenkenthorp's Beach, LHI, *W.W. Watts 524* viii.1911
8. Rocks by Wilson's boatshed, LHI, *W.W. Watts 83* 5.vii.1911
9. North Head, LHI *W.W. Watts 488* viii.1911

PROTO: 'Sandy cliff by Flagstaff (n 300, 174); rocks near Wilson's (n 84, 83); Blenkenthorp's Beach (n 524); rocks by sea, Johnson's (n 108); stone-border, Wilson's garden (n 502 ex.p.); on rocks, Middle Beach (n 106) etc.'

ISOSYNTYPE: NSW (*Watts 83, 84, 106, 108, 174, 300, 502, 524*)

SYNTYPE: H-BR (*Watts 83, 84, 106, 108, 174, 300, 502, 524*)

REC: [Lectotype not yet chosen]

Trachyloma wattsii *Broth.* (Broth. & Watts 1915a: 377)

LABEL:
1. Mt Gower, LHI, *W.W. Watts 357* 1–4.vii.1911

PROTO: 'Mt Gower (n 357)'

ISOTYPE: NSW

HOLOTYPE: H-BR

REC: [Specimen in H-BR is annotated as holotype by G. Scott 17.5.1976, conf. N. Miller & M. Manuel 1982]

Invalid Names

Bryum whiteleggei Broth. (1892: 277)

LABEL:
1. LHI, *T. Whitelegge* 14.ix.1887
2. LHI *5*

REC: [Specimen cited without valid description — *nom. nud.* see Brotherus & Watts 1915a: 384]

Fissidens howeanus Broth. ex Whitelegge (1892: 277)

LABEL:
1. Near Capt. Nicholl's farm, LHI, *T. Whitelegge 19B* viii.1887

REC: [Accepted as valid species in Index Muscorum. *B. howeanus* was listed in Whitelegge & Brotherus (1892: 277) but without description -*nom. nud.*: see Brotherus & Watts (1915a: 384)]

Register of Type Specimens at NSW: Vanuatu (New Hebrides)

(Relevant latitudes and longitudes are Aneityum Is. 20°14′S 169°51′E ; Futuna Is. 19°32′S 170°12′E; Epi Is. 16°50′S 168°20′E; Paama Is. 16° 25′S 168°15′E; Espiritu Santo Is. 15°31′S 167°E.)

Barbula aneitensis *Broth. & Watts* (1915b: 136–7)

LABEL:
1. S.W. side Aneityum Island c. Gunn v-vi. 1913, *Watts 416* Aneityum Island 19°32′S 170°32′E.

PROTO: 'Aneityum: Gunn May-June 1913 (Hb Watts 416)'.

ISOTYPE: NSW

HOLOTYPE: H-BR

REC: [=*B. subcomosa* Broth. det. D.H. Norris. Annotated lectotype on packet at H-BR by D.H. Norris ix.1985 but this is neither validly published nor necessary]

Callicostella frateri *Broth. & Watts* (1915b: 145–6)

LABEL:
1. Paama Island. Dr. Gunn and Rev. Frater 1912. Hb. *Watts 259*

PROTO: 'Paama: Gunn & Frater 1912 (Hb. Watts 259)'

ISOTYPE: NSW

HOLOTYPE: H-BR

REC: [Annotated as lectotype by D.H.Norris Nov. 1982 and det. as =*C. papillata* (Mont.) Mitt. xii.1986). This has not been published and lectotypification is not necessary]

Camptochaete prolongata *Broth. & Watts* (1915b: 144)

LABEL:
1. Aneityum Island, Dr. *Gunn 1912* ex Herb. Rev. D. Lillie

PROTO: 'Aneityum: Gunn 1912 (Hb. Lillie 749)'

PARATYPE: NSW

HOLOTYPE: H-BR

REC: [NSW specimen fits protologue but no number is given hence this is named here as paratype.]

Chaetomitrium aneitense *Broth. & Watts* (1915b: 146)

LABEL:
1. Aneityum Island per Dr. Gunn vii-viii.1913. *Watts 474*

PROTO: 'Aneityum: Gunn 1913 (Hb Watts 474)'

ISOTYPE: NSW

HOLOTYPE: H-BR

REC: [Annotated on packet as lectotype by D.H. Norris ix.1986. This was not published nor is it necessary]

Clastobryum hebridense *Broth. & Watts* (1915b: 144–5)

LABEL:
1. Aneityum Island Dr. Gunn ii.1913 *Watts 387*

PROTO: 'Aneityum: Gunn Feb. 1913 (Hb Watts 387)'

ISOTYPE: NSW

HOLOTYPE: H

REC: [This number occurs in the main Herbarium (H) Brotherus No. R11468 and not in the Brotherus Herbarium (H-BR). As he must have seen this specimen it is most likely the holotype]

Ectropothecium aneitense *Broth. & Watts* (1915b: 149)

LABEL:
1. Aneityum Island, Gunn ii.1913 Hb. *Watts 379*
2. Aneityum Island Gunn ii.1913 Hb. *Watts 382*
3. Aneityum Island, Dr Gunn 1912 ex Hb. Rev. D. Lillie.

PROTO: 'Aneityum: Gunn 1912 (Hb. Lillie 760, 761) Feb. 1913 (Hb. Watts 379, 382b).'

ISOSYNTYPE: NSW (Watts 379, 382)

PARATYPE: NSW (Hb Lillie)

SYNTYPE: H-BR (Watts 379, 382; Hb. Lillie 760, 761)

REC: [Specimen 3 above does not have a number but as the rest of the data fit it is named here as a paratype. Lectotype needs to be chosen]

Ectropothecium bowiei *Broth. & Watts* (1915b: 149)

LABEL:
1. Santo, F.G.Bowie xi.1909 Hb. *Watts 53.*
2. F.G.Bowie 1909 Hb. *Watts 106.*

PROTO: 'Santo: Bowie 1909 (Hb. Watts 53, 106)'

ISOSYNTYPE: NSW (Watts 53, 106)

SYNTYPE: H-BR (Watts 53, 106)

REC: [Needs to be lectotypified]

Ectropothecium brachyphyllum *Broth. & Watts* (1915b: 150)

LABEL:
1. SW side of Aneityum Island Dr Gunn v-vi.1913 Hb. *Watts 425* (3 specimens)
2. Aneityum Island, Dr. Gunn v-vi.1913 Hb. *Watts 458* (2 specimens)

PROTO: 'Aneityum: Gunn May-June 1913 (Hb Watts 425, 458)'

ISOSYNTYPE: NSW (Watts 425, 428)

SYNTYPE: H-BR (Watts 425, 428)

REC: [A lectotype needs to be chosen]

Ectropothecium gunnii *Broth. & Watts* (1915b: 150)

LABEL:
1. Aneityum Island comm. natives Dr. Gunn ii. 1913 Hb. *Watts 383*
2. Aneityum Island comm. natives, Dr. Gunn ii. 1913 Hb. *Watts 393*
3. Aneityum Island Dr Gunn v-vi 1913 Hb. *Watts 404*
4. Aneityum Island Dr. Gunn v-vi 1913 Hb. *Watts 459*

PROTO: 'Aneityum: Gunn (Hb. Watts 383, 393, 404, 459)'

ISOSYNTYPE: NSW (Watts 383, 393, 404, 459)

SYNTYPE: H-BR (Watts 383, 393, 404, 459)

REC: [Needs to be lectotypified]

Epipterygium vanuatuicum *H.A. Miller* (1988: 133–7)

LABEL:
1.Vanuatu: Ambrym Island, east fork of Woala River, in narrow gulch, 1700–1900 ft.alt. *H.A. Miller 19389*, 23 September 1985, ex Hb. Harvey A. Miller

PROTO: 'Vanuatu, Ambryn Island, East fork of Woala River, 550m, in deep gulch, 23 Sep 1985, H.A.Miller 19389'

ISOTYPE: NSW

HOLOTYPE: MU

REC: [recently described — Miller (1988: 133–137)]

Euptychium assimile *Broth. & Watts* (1915b: 140)

LABEL:
1. Futuna Island Dr. Gunn x.1910 Hb. *Watts 208*

PROTO: 'Futuna: Gunn 1910 (Hb Watts 208, Hb Lillie 530) Aneityum: Gunn 1611 (Hb Watts 181)'

ISOLECTOTYPE: NSW (Watts 208)
LECTOTYPE: H (?Hb Watts 208 or ? Hb. Lillie 530) During (1977: 69), [not clear which was chosen]; ISOLECTOTYPE: BM (specimen not cited); FH (specimen not cited); JE (specimen not cited); ISOLECTOTYPE: H-BR (?Watts 208 or Hb. Lillie 530); SYNTYPE: H-BR (Watts 181)

REC: [Specimens in H-BR annotated = *E. setigerum* (Sull.) Broth. subspecies *setigerum* (det. During 1976). Lectotypified by During (1977: 69) but not clear which of two specimens *Watts 208 or Hb. Lillie 530* was chosen hence clarification needed to confirm validity of lectotype. During did not examine the collections from NSW]

Euptychium gunnii *Broth. & Watts* (1915b: 140–1)

LABEL:
1. Aneityum Island Dr. Gunn 1911 Hb. *Watts 145* Det. Broth. (2 specimens)
2. Aneityum Island Dr. Gunn ii.1913 Hb. *Watts 358* conf. Broth.
3. Aneityum Island, Dr. Gunn ii.1913 Hb. *Watts 366* confd. Broth.
4. S.W. side Ancityum Island Dr. Gunn v-vi.1913 Hb. *Watts 422* (3 specimens)
5. S.W. side Aneityum Island Dr. Gunn v-vi.1913 Hb *Watts 462*. Confd. Broth.
6. Aneityum Island Dr.Gunn iii.1911 Hb. *Watts 225* (3 specimens)
7. S.W. side Aneityum Island, comm. Gunn v-vi 1913 Hb. *Watts 424* Det. Broth.
8. S.W. side Aneityum Island comm. Gunn v-vi.1913 Hb. *Watts 435* Det. Broth.
9. Aneityum Island, Natives comm. Dr. Gunn ii.1913 Hb. *Watts 358* Det. Broth.

PROTO: 'Aneityum: Gunn 1911 (Hb.Watts 145, 225 cfr 'Hb. Lillie 536') Feb. 1913 (Hb. Watts 358, 366) May-June 1913 (Hb. Watts 422, 424, 435, 462)'

ISOLECTOTYPE: NSW (Watts 145); ISOSYNTYPE: NSW (Watts 225, 358, 366, 422, 424, 435, 462)

LECTOTYPE: H-BR (Watts 145) During (1977:69); ISOLECTOTYPE: BM (Watts 145); SYNTYPE: H-BR (Watts 225cfr, 358, 366, 422, 424, 435, 462; Hb. Lillie 536)

ISOSYNTYPE: BM (Watts 225); JE (Watts 225)

REC: [All specimens at H-BR were determined as = *E. setigerum* subspecies *setigerum* by During 1976. Lectotypified by During (1977: 69). None of the specimens in NSW were examined by During.]

Fissidens scabrisetus *Broth. & Watts* (1915b: 132)

LABEL:
1. Paama: Dr Gunn & Frater vi.1912 Hb. *Watts 255*

PROTO: 'Paama: Gunn & Frater, June 1912 (Hb. Watts, 215)'

ISOTYPE: NSW

HOLOTYPE: H-BR

Hyophila microphylla *Broth. & Watts* (1915b: 136)

LABEL:
1. Aneityum Island Dr. Gunn Hb. *Watts 192.* Det. Broth.
2. Aneityum Island, comm. Gunn, ii.1913 Hb. *Watts 353.* (3 specimens).
3. Aneityum Island, W, Gunn 1912 ex. Hb. Lillie.

PROTO: 'Aneityum Island: Gunn Oct. 1911 (Hb. Watts 192, Hb. Lillie 699) 1912 (Hb. Lillie 741) Feb. 1913 (Hb. Watts 353)'

ISOSYNTYPE: NSW (Hb. Watts 192, 353); PARATYPE: NSW (ex Hb. Lillie)

SYNTYPE: H-BR (Hb. Watts 192, 353; Hb. Lillie 699, 741)

REC: [On specimen 3 above the data fits although number missing and the specimen is named here as a paratype. Lectotype needs to be chosen]

Hypnodendron flagelliferum *Broth. & Watts* (1915b: 156)

LABEL :
1. Aneityum Island, Gunn 1911. Hb. *Watts 144*, Det. Broth.
2. N. side Aneityum Island, Dr. Gunn v-vi.1913 Hb.*Watts 402*, Hb. NSW M36
3. S.W. side Aneityum Island, Gunn. v-vi.1913 Hb. *Watts 417.*

PROTO: 'Aneityum: Gunn 1911(Hb. Watts 144, Hb. Lillie 689) 1912 (Hb Lillie 746); May-June 1913 (Hb. Watts 402, north side & 417 south-west side).'

ISOSYNTYPE: NSW (Gunn 144=689, Watts 402, 417); LECTOTYPE: H-BR (Hb. Lillie 746, Touw 1971:152);

ISOLECTOTYPE: BM (Hb. Lillie 746); L (Hb. Lillie 746); SYNTYPE: H-BR (Watts 402, 417, Hb. Lillie 689)

ISOSYNTYPE: H-BR (Hb. Watts 144)

REC: [No additional information]

Hypopterygium bowiei *Broth. & Watts* (1915b: 147)

LABEL:
1. Tangoa, Santo F.G. Bowie 1906 comm. Murdoch x.1911 Hb. *Watts*

PROTO: 'Santo: Bowie (Hb Watts 73 Comm. Murdoch)'

PARATYPE: NSW

HOLOTYPE: H-BR

REC: [Specimens at H-BR on loan for revision elsewhere, no details available. Specimen at NSW is missing its number although other data are correct and is named here as a paratype]

Isopterygium gunnii *Broth. & Watts* (1915b: 151)

LABEL :
1. Futuna Island, Dr Gunn, x.1910. Hb. *Watts 209.*
2. Futuna Island.

PROTO: 'Futuna: Gunn, Dec. 1910 (Hb Watts 209, Hb Lillie 519)'

ISOSYNTYPE: NSW (Watts 209)

SYNTYPE: H-BR (Watts 209, Lillie 519)

REC: [Specimen 2. above only gives Futuna ls. but fits locality, possibly a syntype or paratype. Species not yet lectotypified]

Leucobryum aneitense *Broth. & Watts* (1915b: 130–1)

LABEL :
1. Aneityum Island Dr Gunn, iii.1911 Hb. *Watts 241* Det. Broth. (2 specimens)
2. Aneityum Island, Dr. Gunn, ii.1911 Hb. *Watts 230.*
3. Aneityum Island. Natives, Dr. Gunn 1913. Hb. *Watts 357a* Det. Broth. (3 specimens).

PROTO: 'Aneityum: Gunn, 1911 (Hb Watts, 241, 230, ex p.,) 1912 (Hb Lillie, 736), 1913 (Hb Watts, 357a). Det.Broth. Hb Watts 241'

ISOSYNTYPE: NSW (Watts 241, 357a); SYNTYPE: NSW (Watts 230)

SYNTYPE: H-BR (Watts 241, 357a, Lillie 736)

REC: [Not yet lectotypified]

Leucobryum gunnii *Broth. & Watts* (1915b: 130)

LABEL :
1. Aneityum Island, Gunn v-vi.1913 Hb. *Watts 454a* (3 specimens)
2. Aneityum Island, comm. Gunn, ii.1913 (2 specimens) Hb. *Watts 357c.*
3. Futuna Island, Natives, Gunn. x.1912, Hb. *Watts 303.*

PROTO: 'Futuna: Gunn Oct. 1913. (Hb Watts, 303); Aneityum: Gunn, 1913 (Hb Watts 357c, 454a).'

ISOSYNTYPE: NSW (Watts 303, 357c, 454a)

SYNTYPE: H-BR (Watts 303, 357c, 454a)

REC: [Not yet lectotypified]

Leucoloma subtenuifolium *Broth. & Watts* (1915b: 128–9)

LABEL:
1. Aneityum Island, Gunn, viii. 1912. Hb. *Watts 271*, det. Broth.
2. Aneityum Island, natives, comm Gunn ii.1913 Hb. *Watts 344* Det. Broth. (2 specimens).
3. North side Aneityum Island, comm. Gunn v-vi.1913 Hb. *Watts 407* det. Broth.
4. Aneityum Island, S.W. side, comm. Gunn, v-vi. 1913 Hb. *Watts 421* (3 specimens).

PROTO: 'Futuna: Gunn, March-April, 1910 (Hb. Lillie, 523).; Aneityum: Gunn, 1911 (Hb. Lillie, 544, 694), Aug. 1912 (Hb. Watts, 271, Hb. Lillie, 728), Feb 1913 (Hb. Watts, 344), May-June, 1913 (Hb. Watts, 407, 421).'

ISOSYNTYPE: NSW (Watts 271, 344, 407, 421)

SYNTYPE: H-BR (Hb. Lillie 523, 544, 694, 728, Hb. Watts 271, 344, 407, 421)

REC: [not yet lectotypified]

Papillaria pellucida *Broth. & Watts* (1915b: 141–2)

LABEL:
1. Futuna Island. Dr Gunn, 28.xii.1910 Hb *Watts 212*
2. Aneityum Island, Dr. Gunn, iii.1911. Hb. *Watts 236*
3. Aneityum Island, Dr. Gunn, iii.1911. Hb. *Watts 239–240* Det. Broth.
4. Futuna Island, Comm. Gunn. x.1912 Hb. *Watts 295* .

PROTO: 'Futuna: Gunn, Dec., 1910 (Hb Watts, 212, 236, 239); 1911 (295); Aneityum: GUNN, MARCH, 1911 (240).'

ISOSYNTYPE: NSW (212, 236, ?239–240, 295)

SYNTYPE: H-BR (specimens on loan)

REC: [*Watts 295* has correct number but year in protologue is 1912 not 1911— may be an error in protologue; *Watts 236* has correct number but year is 1911 whereas in protologue it is 1910— may be an error in protologue; not yet lectotypified]

Rhynchostegium oblongifolium *Broth. & Watts* (1915b: 156)

LABEL :
1. Santo. F.G. Bowie, 1909. Hb *Watts 116*
2. Futuna Island. Comm. Dr. Gunn x.1912 Hb. Watts 302. Det. Broth.

PROTO: 'Santo: Bowie 1909 (Hb Watts, 116). Futuna: Gunn, Oct., 1912 (302).'

SYNTYPE: NSW (Watts 116, 302)

REC: [No specimens located in H-BR. Needs to be lectotypified]

Sematophyllum glabrifolium *Broth. & Watts* (1915b: 154)

LABEL: S-W side Aneityum Island. Gunn v-vi.1913. *Watts 436a*

PROTO: 'Aneityum, south-west side; Gunn, May-June, 1913 (Hb Watts 436a)'

ISOTYPE: NSW (Watts 436a)

HOLOTYPE: H-BR (Watts 436a)

REC: [Specimen at H-BR must be the Holotype; =*Aptychella glabrifolia* on folder in H-BR]

Sematophyllum serricalyx *Broth. & Watts* (1915b: 154–5)

LABEL:
1. Aneityum Island. Comm. Dr Gunn, v-vi. 1913. *Watts 457.*
2. Santo, F.G. Bowie xi.1909 Hb. *Watts 63* Det. Broth.
3. Aneityum, Gunn v-vi.1913

PROTO: 'Santo: Bowie, 1909 (Hb Watts, 56 e.p., 63 c.fr.). Epi: Riddle, Jan., 1911 (135); Aneityum: Gunn, 444, 447, 457); Futuna: Gunn, Oct., 192 (329) [192=1912].'

ISOSYNTYPE: NSW (Watts 63, 457)

SYNTYPE: H-BR (Watts 63cfr, 135, 282, 444, 447, 457)

REC: [Needs lectotypification; Location of *Watts 56 e.p., 329* unknown]

Symphysodon gunnii *Broth. & Watts* (1915b: 140)

LABEL:
1. Aneityum Island, Dr. Gunn iii.1911, Hb. *Watts 221*
2. Futuna Island. Natives comm. Dr. Gunn x.1912. Hb. *Watts 296* Det. Broth. (3 specimens)
3. Futuna Island, Dr. Gunn x.1910, Hb. *Watts 202*
4. Futuna Island, Dr. Gunn, seen by Watts 28.x.1910. Hb. *Watts 202.*
5. Epi Island, T.E. Riddle, i.1911, Hb. *Watts 131* Det. Broth. (2 specimens).
6. Epi Island, T. E. Riddle, i.1911 Hb. *Watts 142*

PROTO: 'Futuna: Gunn, 1910 (Hb Watts, 202), Oct. 1912 (296, forma *viridis*); Aneityum 1911, Gunn, (221); Epi: Riddle, Jan., 1911 (Hb. Watts, 131, c.fr, and 142)'

ISOSYNTYPE: NSW (Watts 131, 202, 296); SYNTYPE: NSW (Watts 142, 221)

SYNTYPE: H-BR (Watts 131 c.f.r., 202, 296)

REC: [Specimen 5. above may be part of type, but data incomplete and number differs, *Watts 296* det. as *S.gunnii* f. *viridus* by V.F. Brotherus. Location of *Watts 142* unknown. Not yet lectotypified]

Synodontia aneitensis *Broth. & Watts* (1915b: 129–130)

LABEL:
1. Aneityum Island (5 specimens) Comm. Gunn ii.1913. Hb. *Watts 375.*
2. Aneityum Island, Comm. Gunn ii.1913 Hb. *Watts 377a.*

PROTO: 'Aneityum: Gunn, 1911 (Hb. Lillie 701), Feb. 1913 (Hb. Watts, 375, 377a).'

ISOSYNTYPE: NSW (Watts 377a); SYNTYPE: NSW (Watts 375)

SYNTYPE: H-BR (Watts 377a)

REC: [Not yet lectotypified]

Syrrhopodon diversiretis *Broth. & Watts* (1915b: 134)

LABEL:
1. Aneityum Island, natives, comm. Gunn ii.1913. Hb. *Watts 352a.*
2. Aneityum Island, SW side. Comm. Gunn v-vi.1913, *Watts 434.* (4 specimens).

PROTO: 'Aneityum: Gunn, Feb., 1913 (Hb. Watts, 352a); S.W. side, May-June, 1913 (Hb Watts, 434).'

ISOTYPE: NSW (Watts 352a); SYNTYPE: NSW (Watts 434)

LECTOTYPE: H-BR (352a)

REC: [*Watts 352a* at H-BR labelled syntype by W.D. Reese; =*S. japonicus* (Besch.) Broth. W.D. Reese (1984); cited as lectotype and *syn. nov.* under *S. japonicus* Reese & Mohamed, (1985: 227). Specimens at NSW were not cited in publication but have been seen by W. D. Reese and determined by him in 1987 — *Watts 434* and *Watts 352a* are syntypes = *S. japonicus*]

Syrrhopodon lilliei *Broth. & Watts* (1915b: 133)

LABEL:
1. Aneityum Island, Comm. Gunn ii. 1913, Hb. *Watts 350* (4 specimens)

PROTO: 'Aneityum: Gunn, 1912 (Hb. Lillie, 740), Feb. 1913 (Hb. Watts, 350)'

ISOSYNTYPE: NSW (Watts 350)

SYNTYPE: H-BR (Watts 350)

REC: [Location of specimen *Lillie 740* not known; =*S. trachyphyllus* Mont. as *syn. nov.* Mohamed & Reese, (1985: 243) who do not specify the precise nature of the type; they examined a specimen from NY which would be a syntype, the specimen at H-BR should be chosen as the lectotype. Specimens at NSW were not seen by W. D. Reese until 1987 when he confirmed *Watts 350* as syntype =*S.trachyphyllus*]

Syrrhopodon perarmatus *Broth. & Watts* (1915b: 133–4)

LABEL:
1. Santo, F.G. Bowie 1909. Hb *Watts 89* (2 specimens).
2. Aneityum Island, Dr. Gunn x.1911, Hb. *Watts 193* Det. Broth. (2 specimens)
3. Aneityum Island, N. side. Comm. Gunn iii.1913. Hb. *Watts 410* (3 specimens)
4. Futuna Island, Natives, comm. Gunn x.1912. Hb. *Watts 292* Det. Broth. 1912

PROTO: 'Santo: Bowie, 1909 (Hb. Watts, 89); Aneityum: Gunn,Oct., 1911 (Hb. Watts 193, Hb. Lillie, 697), May-June,1913 (Hb. Watts, 410); Futuna: Gunn, Oct. 1912 (Hb. Watts, 292).'

SYNTYPE: NSW (Watts 89, 193, 410);

ISOTYPE: NSW (Watts 292)

SYNTYPE: H-BR (Watts 292, Hb. Lillie 697).

REC: [Not yet lectotypified. *Watts 292* in H-BR designated syntype by W. D. Reese 1984; specimen Hb. Lillie, H-BR labelled syntype in pencil but no specimen in NSW has

this number. H. Mohamed & W. D. Reese (1985) retain *S. perarmatus* Broth. & Watts as a species closely allied to *S. spiculosus* ; specimens at NSW not examined by W. D. Reese until 1987 when the following were confirmed as syntypes, *Watts 89, 193, 292, 410*]

Syrrhopodon tenuinervis *Broth. & Watts* (1915b: 135)

LABEL: Futuna Island, Natives, Comm. Dr. Gunn x.1912, Hb. *Watts 318* 'Futuna: Gunn, Oct., 1912 (Hb Watts 318)'

ISOTYPE: NSW (Watts 318)

HOLOTYPE: ?

REC: [no specimen located at H-BR, this species not mentioned in H. Mohamed & W. D. Reese (1985); specimens seen by W.D. Reese in 1987 designated as isotype = *S. japonicus* (Besch.) Broth.; location of the holotype is not known]

Taxithelium annandii *Broth. & Watts* (1915b: 152)

LABEL:
1. Tangoa, Santo Dr. Annand xiii.1903. Hb. *Watts 10.*
2. Tangoa, Santo Dr. Annand xiii.1903 Hb. *Watts 17*
3. Tangoa, Santo Dr. Annand xiii.1903 Hb. *Watts 21.*

PROTO: 'Tangoa, Santo: Annand, Dec, 1903 (Hb. Watts 10, 17, 21 e.p.)'

ISOSYNTYPE: NSW (Watts 10, 21e.p.); SYNTYPE: NSW (Watts 17)

SYNTYPE: H-BR (Watts 10, 21)

REC: [Not yet lectotypified]

Trichosteleum gunnii *Broth. & Watts* (1915b: 153)

LABEL:
1. Aneityum Island Comm. Gunn ii.1913 Hb. *Watts 384* (4 specimens)
2. Aneityum Island, Comm. Gunn ii.1913 Hb. *Watts 382c*
3. Aneityum Island, W. Gunn 1912, ex. Hb. D. Lillie. (2 specimens)

PROTO: 'Gunn, 1912 (Hb. Lillie, 755), Feb., 1913 (Hb Watts, 384, 382c).'

ISOLECTOTYPE: NSW (Watts 382c, 384)

SYNTYPE: H-BR(Watts 382c, 384, Hb. Lillie 755)

REC: [Not yet lectotypified. Specimens 3 above ex Hb. Lillie but without number, but must represent isosyntypes, or paratypes]

Trichosteleum subtile *Broth & Watts* (1915b: 153)

LABEL: Paama: Dr. Gunn & Rev. Frater vi. 1912. *Watts 256* (2 specimens)

PROTO: 'Paama: Gunn & Frater, June, 1912 (Hb. Watts, 256, 258)'

ISOSYNTYPE: NSW (Watts 256)

SYNTYPE: H-BR (Watts 256, 258)

REC: [Not yet lectotypified]

Missing Type Specimens

No type specimens were located at NSW for the following species described in Brotherus & Watts (1915a,b):

Syrrhopodon anietensis (Hb. Lillie 688)

Invalid Names

Barbula crispatula C. Muell. (1897: 104)

LABEL: Santo, New Hebrides, F.G. Bowie, 1909. Hb. *Watts 88.*

REC: [*nom. inval. in synon. err. pro. Syntypetrichia crispatula* C. Muell. Listed only for AM2 in Wijk et al. 1959) = *Calyptopogon mnioides* (Schwaegr.) Broth. *fid.* Salm. *J. Bot.* 41: 3 (1903)]

Floribundaria pseudo-floribunda Fleisch. var. *tenuiramea* Broth. & Watts (1915b: 143)

LABEL: Futuna Island Dr Gunn iii-iv.1911 Com. D. Lillie

PROTO: 'Futuna: Gunn 1911 (Hb Lillie)'

REC: [This is the specimen referred to but without valid description — *nom. nud.*]

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SHORT COMMUNICATION

Rediscovery of *Haloragodendron lucasii* (Haloragaceae)

In my revision of the genus (Orchard 1975) I suggested that *Haloragodendron lucasii* might be extinct. No collections had been made for 50 years, and earlier records were all from the vicinity of Hornsby, New South Wales, in an area largely swallowed up by suburban development.

Happily, my gloomy suggestion has been proven false, with not one but two separate rediscoveries of the species. One population is from Barra Brui, not far from previous records in the Central Coast subdivision of NSW, the other is from Yarramun Creek near Mount Wilson in the Central Tablelands, representing a major extension of range.

Both collections are in flower and fruit. The Barra Brui collection agrees quite well with earlier specimens, although it is smaller in several of its measurements. The fruits are only semi-mature, but are winged, as previously described. The Yarramun Creek collection agrees also in most respects, but has a bluntly angled rather than winged fruit. It has been suggested (Peter G. Wilson, pers. comm.) that this specimen could represent a fourth species of the genus for New South Wales. While this is possible, and could be resolved by further field study or cultivation (particularly of seedlings), for the time being I am inclined to consider it as merely a variant of *H. lucasii*. It agrees with that species in all essential respects except fruit shape, a character that is known to be variable in this family, (Orchard 1975) — see for example *Haloragis acutangula, Haloragis odontocarpa, Haloragis aspera* and *Glischrocaryon aureum*.

An expanded description incorporating the new collections is given below.

Haloragodendron lucasii *(Maiden & Betche) Orchard*, Bull. Auckland Inst. Mus. 10: 146–148 (1975).

Erect multistemmed shrub 1(–3) m tall, older stems with smooth grey bark, younger stems green to reddish, arranged decussately, 4-winged or -angled. Leaves decussate, sessile, oblanceolate, 2.3–3.0(–5.0) cm long, 0.4–0.6 cm wide, widest about two-thirds of the way to the acute apex, coriaceous, darker green above than beneath, serrate (rarely slightly biserrate) with 10–24 short teeth per leaf, mainly in the distal ½ to ⅔; midrib channelled above, prominent below, lateral veins not visible.

Inflorescence terminal on young stems. Axis terminated by a simple dichasium, with simple dichasia in the axils of the upper 3–4 pairs of primary bracts. Lateral inflorescences, similar to the terminal one but extending over only 1–3 nodes, are borne in the axils of the 3–6 (sometimes more) pairs of leaves immediately below the terminal inflorescence. Within each inflorescence the terminal flower of the terminal dichasium develops first, followed by the terminal flowers of the two lowest dichasia. The terminal flowers of the intermediate diachasia then open in basifugal order. The lateral flowers of each dichasium abort. Primary bracts similar in size and shape to upper leaves. Secondary bracts green to brown, opaque, lanceolate, ± 2–3 mm long, 0.4 mm wide, entire, deciduous before anthesis. Tertiary bracts extremely minute, deciduous early with lateral flowers of the dichasium.

Flowers mostly hermaphroditc, sub-sessile on a pedicel 0.3 mm long. Sepals 4, broadly deltoid, 1–2 mm long, 1.5–1.7 mm wide, erect. Petals 4, creamy white, strongly twisted in bud, very shallowly navicular (almost planar) in flower, lanceolate, (7–)9.5–12(–14) mm long, 1.8–2.5 mm wide, becoming twisted again before abscission. Stamens 8, filaments 1.5–2.5 mm long; anthers yellow with reddish connective, narrowly sagittate, (4.0–)5.5–7.0 mm long, 0.5–0.6 wide at base, somewhat compressed, tapering to a blunt point at the apex. Styles 4, conical at first, later capped with a saddle-shaped fimbriate stigma. Ovary glabrous, ellipsoid, 4.2 mm long, 2.5 mm wide including the 4 longitudinal antipetalous wings 0.5 mm wide. Lower flowers of the inflorescence sometimes functionally male; as for the hemaphrodite flowers, but a little smaller, on pedicels 2 mm long, styles and ovary vestigial.

Fruit on pedicels up to 3 mm long, usually winged, body of fruit at least 5 mm long, 4–5 mm wide (incl. wings), but not seen fully mature. Fruit of the Yarramun Creek collection ovoid, 4-angled instead of winged, 6–7 mm long, 4 mm wide, endocarp woody, septa membranous and pushed aside by the developing 1 (or 2) seeds.

Ecology: The collectors described the Barra Brui plants as being locally frequent on a south-facing sandstone hillside with *Eucalyptus gummifera, E. piperita, Elaeocarpus reticulatus, Banksia oblongifolia, Leptospermum trinervium, Hakea teretifolia* etc. in a *Gleichenia dicarpa* thicket at an altitude of 110 m. The Yarramun Creek collection was growing on a creek bank in *Eucalyptus oreades* open forest with *Ceratopetalum apetalum, Logania albiflora, Todea barbara, Gahnia* sp. and *Prostanthera* sp. at 730 m.

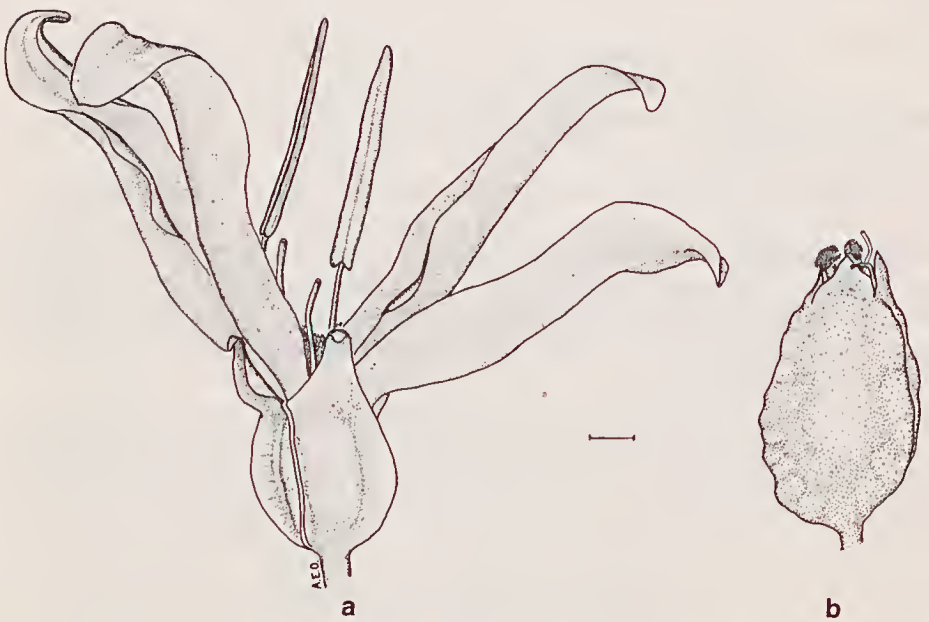

Fig. 1. *Haloragodendron lucasii.* a old hermaphrodite flower/young fruit, showing the development of wings on the ovary. b fruit of Yarramun Creek collection, with 4 irregular longitudinal angles instead of wings. (a from *Coveny 12368 et al.*, b from *Lembit NSW 17100423.* Scale represents 1 mm for both illustrations).

Specimens Examined: New South Wales: Central Coast: Barra Brui near Scout Hall, *Coveny 12368 et al.*, 22 Oct. 1986 (HO). Central Tablelands: Yarramun Creek, 7 km NNW of Mount Wilson, *Lembitt NSW 171423*, 7 Dec. 1986 (HO). (Original collections of both in NSW, n.v.)

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SHORT COMMUNICATION

Indigofera psammophila (Fabaceae), a new species from arid Australia

This species is described here to make the name available for the Flora of New South Wales. It has often been referred to as *I. brevidens* but is not closely related to that species. *I. brevidens* sens. str. is a shrubby species that occurs in the central west of Queensland and in a few places in the north of the North Western Slopes and Plains of N.S.W., generally in drier areas on gravelly soils; it is most closely related to *I. australis* and *I. adesmiifolia*. The new species, on the other hand, is a perennial herb or subshrub of deep sands and is more closely related to *I. georgei*.

Indigofera psammophila *Peter G. Wilson,* **sp. nov.**

[*I. brevidens* auct. aust. non Benth.: Jacobs & Pickard, Plants of New South Wales (1981); Cunningham et al., Plants of Western New South Wales: 397, photo (1981); Weber, Flora of South Australia: 579, fig. 307A (1986).]

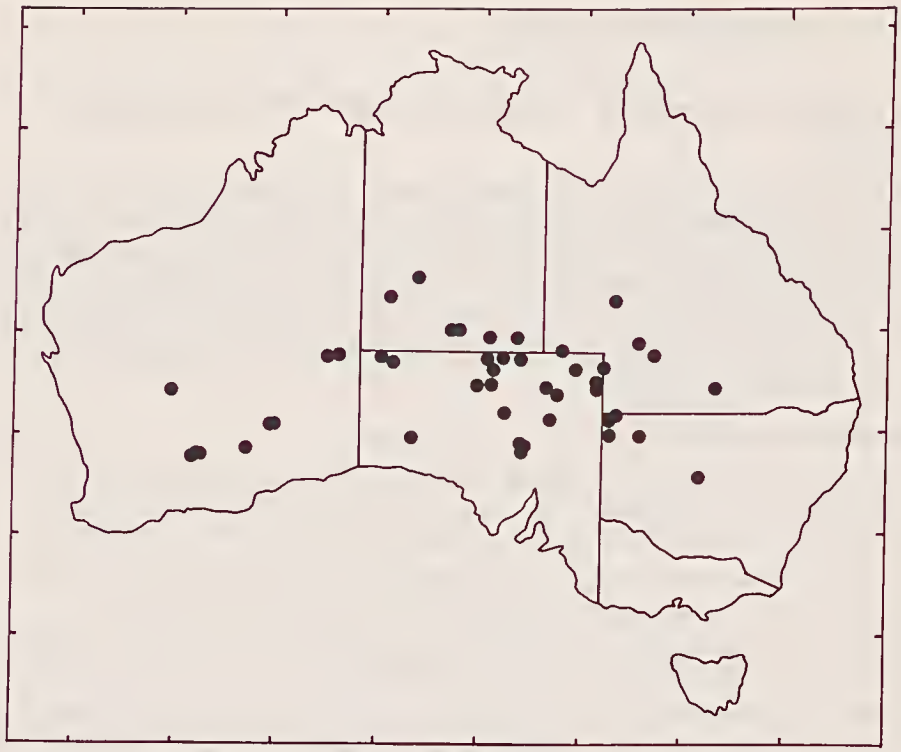
I. georgei affinis sed ramis procumbentibus, foliolis plus numerosis, cinerascentibus (vice canis) et petalis subroseis vel malvinis differt.

HOLOTYPE: NEW SOUTH WALES: North Far Western Plains: 15.1 km E of Fortville Gate, Sturt National Park, *Wilson 115,* 29.10.1986 (NSW). ISOTYPES: AD, BRI, CBG.

Perennial herb or subshrub to 0.5 m high with a woody root-stock; young stems and leaves grey with fine, appressed to spreading equally biramous hairs. *Leaves* pinnate, (5–)7–11(15)-foliolate, 3–8 cm long; rachis grooved above; stipellae small, c. 0.5 mm long; leaflets opposite or subopposite, obovate to cuneate, obtuse and mucronate or emarginate, 3–15 mm long, 1.5–7 mm wide, green to grey, discolorous but more or less equally hairy on both surfaces. *Stipules* narrowly triangular to linear, 1–3.5 mm long. *Inflorescence* exceeding the leaves, an axillary raceme 10–29 cm long when fully developed; bracts linear, 1.5–3 mm long; pedicels 1–2 mm long. *Calyx* 2.5–3 mm long, grey-pubescent, the lobes approximately equal to the tube. *Corolla* pink to mauve, sparsely hairy on the back of the standard and the distal end of the keel; standard broadly elliptical, 5.5–7 mm long, 3.5–5 mm wide, apex obtuse and emarginate or mucronate; wings spathulate, 5–8.5 mm long, 1.5–2 mm wide; keel 5.5–7 mm long, 1.5–2 mm deep, margins ciliate, apex often beaked. *Stamens* 9+1, tube 3–4.5 mm long; anthers apiculate. *Ovary* pubescent; style glabrous; stigma capitate. *Pod* terete, 1.5–3 cm long, 2–3.5 mm wide, white-pubescent; endocarp with light to dark brown spots. *Seeds* 4–10, cuboid, 1.5–2 mm long.

HABITAT AND DISTRIBUTION: widespread throughout central Australia in desert regions, mainly in the Simpson and Great Victoria Deserts, on sand dunes, but with outliers in other areas on sand-plains or alluvial deposits. (Map 1)

SELECTED SPECIMENS EXAMINED: NEW SOUTH WALES: North Western Plains: Sandy Creek, 'Lachlan Downs', *Cunningham & Milthorpe* 1475, 17.11.1973 (NSW). North Far Western Plains: 'Tero Creek' Station, *Martensz 67/107,* 1.4.1967 (NSW). QUEENSLAND: Gregory North: 10 km SSW of 'Brighton Downs', *Purdie 1323,* 17.6.1978 (BRI): Gregory South: 24 km SE of Betoota, *Purdie 1145,* 18.9.1977 (AD,BRI). SOUTH AUSTRALIA: North-western: c. 18 km NE of Mt Kintore summit, *Donner 6626,* 10.9.1978 (AD): Lake Eyre Basin: Warburton River, near new Kalamurina, *Jackson 1975,* 9.3.1972 (AD): Nullarbor: Golf Course, Maralinga, *Turner s.n.,* 23.9.1960 (AD97604554): Gairdner-Torrens Basin: 7 km NE of Twelve Mile Dam, *Fatchen 246,* 4.3.1981 (AD). WESTERN



Map 1. Distribution of *Indigofera psammophila.*

AUSTRALIA: Giles District: 2 miles (c. 3.2 km) W of Cavenagh Range, *George 8738,* 16.7.1967 (CANB, PERTH): Coolgardie District: Cundeelee, *Boswell R69,* 9.1967 (PERTH). NORTHERN TERRITORY: Central South: Ehrenberg Range, *Butler 69,* 5.1967 (PERTH); 4 miles (c. 6.4 km) N of Connor Well, *Chippendale 4678,* 22.7.1958 (AD, NSW).

This species has been confused with *I. brevidens* but differs from that species in having inflorescences exceeding the leaves, calyx teeth all distinct, different habit and indumentum, and in habitat. In these features it more closely resembles *I. georgei,* but it differs from that species in having more numerous grey-green, rather than canescent, leaflets, a more procumbent habit and paler corolla.

There are a number of specimens collected from coastal sand-masses in Western Australia near Carnarvon and Exmouth. These approach *I. psammophila* in general aspect but differ in indumentum and fruit shape; their status is yet to be determined.

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SHORT COMMUNICATION

Amphibromus nervosus (Poaceae), an earlier combination and further synonyms

Arthur Chapman, Bureau of Flora & Fauna, Canberra, has kindly pointed out to me that the combination *Amphibromus nervosus* (J. D. Hook.) Baillon had been made in 1893, earlier than the combination made by G. C. Druce reported in our revision of the genus *Amphibromus* in Australia (Jacobs and Lapinpuro 1986). Baillon's combination had been overlooked by Index Kewensis and by the Chase Index (Chase and Niles 1962). The full citation is: *Amphibromus nervosus* (J. D. Hook.) Baillon, Histoire des Plantes 12: 203 (1893).

BASIONYM: *Danthonia nervosa* J. D. Hook., Fl. Tasm. 2: 121, pl. 163A (1858). Hooker based his combination on the illegitimate *Avena nervosa* R. Br. (see Jacobs and Lapinpuro 1986 for further comment).

Amphibromus nervosus (J. D. Hook.) G. C. Druce then becomes a superfluous combination and is added to the synonymy.

Arthur Chapman also kindly pointed out a synonym that to the best of my knowledge has not been used beyond its initial publication. This synonym is:

Avenastrum nervosum Vierh., Verhandlungen der Gesellschaft Deutscher Naturforscher und Artze 85. Versammlung zu Wien (Leipzig) 1: 672 (1913). This name was based on the illegitimate *Avena nervosa* R. Br. and the protologue apparently does not mention *Danthonia nervosa* J. D. Hook. (A. Chapman pers. com.) so Vierhapper's name is new and dates from his publication and this name has the same type as *Avena nervosa* R. Br.

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Jacobs, S. W. L. & Lapinpuro, L. (1986). The Australian species of *Amphibromus* (Poaceae). *Telopea* 2(6): 715–729.

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SHORT COMMUNICATION

Notes on Australian grasses (Poaceae)

Some new combinations and clarification of some names are required for the next edition of Wheeler et al. (1982).

1. Austrofestuca

Alexeev (1976) established the genus *Austrofestuca* based on the single Australasian species *A. littoralis* (Labill.) Alexeev. Edgar and Connor (1983) have taken up the name but it has not yet been formally used in Australia although Simon (1986) does provide a new combination for *A. pubinervis* (Vickery) B. Simon, a segregate of *A. littoralis*. Alexeev (1987) found an earlier epithet applicable to *A. pubinervis* and made the combination *A. triticoides* (Trin.) Alexeev. Clayton and Renvoize (1986) accepted *Austrofestuca* but found that the characters used to delimit it required the inclusion of three more Australasian species.

Alexeev (1985) established the new genera *Festucella* and *Hookerochloa* for two of these species, *Festuca eriopoda* and *F. hookeriana* respectively. These genera were distinguished from *Austrofestuca* by: (i) *Festucella* having filiform as opposed to folded leaves, and (ii) *Hookerochloa* having awned lemmas.

The characters that have been used by the authors mentioned above to distinguish *Austrofestuca* from *Festuca* include:
(i) lemmas keeled throughout;
(ii) ovary glabrous;
(iii) caryopsis with a short oval hilum (linear to oblong in *Festuca*);
(iv) lodicules pubescent;
(v) lowest lemma 5–11-nerved (3–5-nerved in *Festuca*), and
(vi) callus shortly pubescent.

The first two of these characters are quite consistent in all four species although the second is easily visible only in material at an appropriate stage of development. The hilum character (iii) is useful but mature caryopses are not common on herbarium specimens. The hairiness of the lodicules is also reasonably consistent but not easy to observe; occasionally there are only a few hairs. The nervation of the lemma and the degree of pubescence of the callus are less consistent, the type species frequently having a glabrous callus. On the basis of the first four characters *Austrofestuca*, as delimited by Clayton and Renvoize (1986), should be accepted.

Festucella Alexeev is based on a leaf character that is not qualitative. The character basically is leaf width as even the diagram in Alexeev (1987) shows a trans-section of a folded leaf. The number of nerves also cited as a secondary character is likewise related to leaf width, as are the few anatomical characters mentioned. Leaf width is not an appropriate generic character and *Festucella* here is treated as a synonym of *Austrofestuca*.

Hookerochloa Alexeev is distinguished from *Autrofestuca* by the former having awned lemmas and glabrous lodicules. Awned lemmas are not a consistent character on one inflorescence in this taxon, and many plants have no awns, so it is not an appropriate generic character. Neither *F. hookeriana (Hookerochloa)*

nor *F. eriopoda (Festucella)* have glabrous lodicules; in both species they are more sparsely hairy than in *A. littoralis* or *A. triticoides* but they do have hairs. *Hookerochloa* is also treated here as a synonym of *Austrofestuca*.

The two new combinations required are:

Austrofestuca eriopoda *(J. W. Vickery) S. W. L. Jacobs,* **comb. nov.**

BASIONYM: *Festuca eriopoda* J. W. Vickery (1939: 10–11).
SYNONYM: *Festucella eriopoda* (J. W. Vickery) Alexeev (1985: 104).

Austrofestuca hookeriana *(F. Muell.) S. W. L. Jacobs,* **comb. nov.**

BASIONYM: *Festuca hookeriana* F. Muell. in Hook. f. (1858: 127, t. CLXV).
SYNONYMS: *Poa hookeriana* (F. Muell.) F. Muell. (1873: 131). *Schedonorus hookerianus* (F. Muell.) Benth. (1878: 656). *Hookerochloa hookeriana* (F. Muell.) Alexeev (1985: 106).

The third species occurs only in New Zealand; I am leaving the appropriate combination to authors more familiar with that species.

2. Australopyrum

The literature concerning the classification of the Triticoid grasses is voluminous and has been reviewed by West et al. (1988). There is still much diversity of opinion on the circumscription of genera and their relationships. The endemic Australian species formerly included in *Agropyron* have been treated by Löve (1984) who included them in his genus *Australopyrum*, and Clayton and Renvoize (1986) who maintained them in *Agropyron*. Löve excludes from *Australopyrum, Elymus scaber* which occurs also outside Australia and which was formerly included in *Agropyron*.

The genomic data (Löve 1984) and the shortly pedicellate spikelets of our native species indicate that they are best excluded from the now restricted *Agropyron* (Barkworth and Dewey 1985). Löve made new combinations for our taxa but, without explanation, he reduced *Agropyron velutinum* Nees (1840) to a subspecies of *Australopyrum retrofractum* (J. W. Vickery) A. Löve (*Agropyron retrofractum* J. W. Vickery, 1950). *A. retrofractum* is more closely related to *A. pectinatum* than to *A. velutinum*. Simon (1986) made the combination *Australopyrum velutinum* (Nees) B. Simon and also treated *A. retrofractum* as a synonym of *A. pectinatum*. Wheeler et al. (1982) recognised the three species as distinct and plan to do so again in the new edition.

There is, however, still one problem remaining in using the name *A. retrofractum*. When forming the combination *Australopyrum retrofractum* (J. W. Vickery) A. Löve, Löve united two species and failed to use the earlier epithet *Agropyron velutinum* Nees. The combination for *Australopyrum retrofractum* at specific rank as made by Löve (1984) is incorrect but the basionym is legitimate and, in accordance with article 63.3 of the Code, Löve's combination can be used if *Australopyrum velutinum* is treated as a separate species.

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For explanation and description of the Botanical Divisions and Subdivisions of New South Wales see R.H. Anderson (1961) Introduction. *Contr. New South Wales Natl Herb., Flora New South Wales* Nos. 1–18: 1–15.

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